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Electrical World

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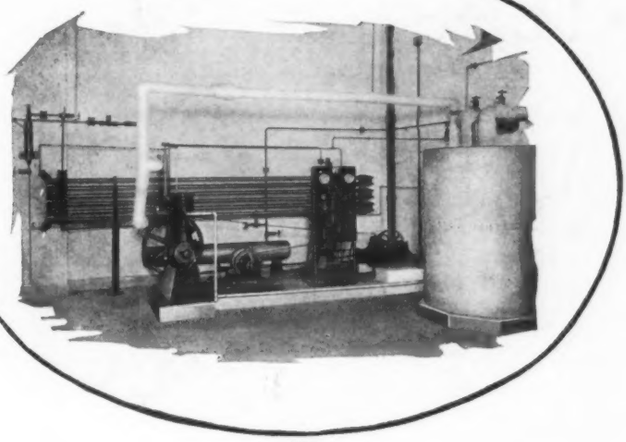

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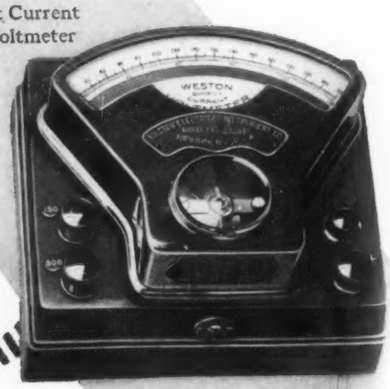

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Electrical World

The consolidation of Electrical World, Electrical Engineer and American Electrician

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Our Unwatched Pot

CONDITIONS in the coal field have turned the thought of many men back to our old unsettled problems of labor and immigration. We replant our forests. We protect our water supply. We irrigate and fertilize our agricultural lands. But we make no effort to guide or to develop our man-power supply, the most fundamental of all our natural resources. Yet this matter of the condition and supply of labor is vital to all industry. It concerns electrical men in no uncertain way.

Today the immigrant comes in, seeks out a colony of his kin and kind and is abandoned. The result we know. But take this picture of the possibilities for America in a common-sense system of selective immigration that would undertake to make him into a prosperous citizen, located where his work will have the most productive value:

OLE OLESON, dairyman, arrives from Sweden, approved by Uncle Sam's agent abroad. He wants to go to Minnesota. "Too many Swedes in Minnesota, Ole," he is told. "They need you most in Indiana. Work there three years, attend school, become a citizen. Go on to Minnesota then, if you still wish." So Ole, with his new settlers' certificate, reports to the New Settlers' Bureau in Indiana and is placed in a dairy job.

In the township where he works he finds a new settlers' committee—the mayor, the school head, two business men, a doctor. He studies a new settlers' course run by the public school. Each year, on New Citizens' Day, which is a national holiday, he marches in the new citizens' parade. The third time it is *his* class that walks in front. For he has passed. He is an American! The mayor, the welcoming committee of leading citizens, all shake his hand. It is a celebration. And he is now free to go to Minnesota. But already he belongs in Indiana, and so he stays.

It is a simple plan, with many advocates. It leads not to the slums nor to the jail, but out into the open country, where there is eternal need for broad backs, sturdy hearts and willing minds.

AMERICAN industries will soon absorb our present unemployed. Home building, public works, our own construction projects will then be needing foreign labor and it will come. Shall we with blind neglect pursue our former course and leave the immigrant to drift—more miners to the glutted coal fields? Or shall we guide him to his opportunity and ours?

Call it a melting pot, if you will, but let the pot be stirred. And pour into this great pot of ours—America—good food for industry and for society, well mixed.

Thomas Ahearn

Pioneer in the establishment and development of electric public utilities in Canada.

TO BE a constructive pioneer in any one of the numerous phases of the electrical industry is a distinction accorded to few. Here, however, is a man who has been a factor in the early commercial development of each of the five major applications of electricity, namely, telegraphy, telephony, light, power and traction—Thomas Ahearn, president of all of the privately operated public utilities in the city of Ottawa, Canada.

Mr. Ahearn was born in Ottawa June 24, 1855. Like so many other pioneers in the electrical industry, he started in the telegraph business, first as a messenger boy and then, as soon as he could learn how, as an operator. At the age of eighteen he had graduated to the main office in New York, where he quickly demonstrated his ability. Four years later he moved up to Western Union headquarters. About this time the telephone came into commercial existence, and it at once fired the enthusiasm of young Ahearn as it did that of so many telegraphers. He saw its possibilities and in 1878 went back to his home city, where he took charge of the telephone department of the Montreal Telegraph Company. He was thus one of the first to enter the telephone field in Canada. In 1880, when the Bell Telephone Company of Canada was organized, Mr. Ahearn became manager at Ottawa. Although he severed active connection with the telephone company in 1887, he has continued to be associated with it in a consulting capacity and in this way has been able to assist in shaping its progress. In 1915 he was elected to the board of directors of the system.

In 1882, when the electrical industry was so young as hardly to be entitled to that designation, Mr. Ahearn and Warren Soper formed a partnership and started in business in Ottawa as electrical engineers and contractors. This firm constructed and equipped some of the largest systems in the Dominion, among which were some lines which were the foundation of what was later to become the North American Telegraph System. In this connection Mr. Ahearn became one of the pioneer constructors of central electric stations in Canada. In 1886, only seven years after Edison's famous discovery of the incandescent lamp, Mr. Ahearn boldly entered the electric service field as one of the founders of the Chaudière Electric Light & Power Company, which nine years later was merged in the Ottawa Electric Company, the last-named company in its turn, with the local gas company, being absorbed by the Ottawa Light, Heat & Power Company.

About the time Mr. Ahearn became engrossed in the development of the electric light the electric street railway came into existence, and in this case, as formerly, he was quick to see the opportunity offered. Winter conditions offered severe handicaps to successful operation so far north, but he was not deterred. He obtained a franchise and, although there was little public confidence in electric railways to back him up, he went ahead and solved the difficulties of operating under severe climatic conditions.

In this manner it has been the privilege of Mr. Ahearn to be a pioneer in each of the major applications of electricity. He has kept abreast of developments and maintained a close contact with every phase of the art. Today, besides being the executive head of all of the privately owned and operated public utilities in Ottawa, he is looked to throughout the entire Dominion of Canada as one of the leading authorities of that country in all public utility matters.

Editorial Comment

Electrical World, April 29, 1922

Volume 79 Number 17

Erroneous Information from Official Sources

THE public statement of the New York Public Service Commission this week relative to certain rate reductions ordered is a curious mixture of fact and fiction.

"Public utilities," reads an explanatory note in the statement, which reiterates what the commission said last fall, "just as other departments of business, must expect to cope with periods of depression and short earnings, just as at other times they enjoy periods of prosperity and full dividends. If the public is expected to make up every deficiency in order to give a utility a good round rate of earning power, then the public is entitled to the benefit of the surplus over the agreed-upon earning ratio in times of prosperity. It must be borne in mind that we are not dealing with the conditions of 1920, nor with the previous abnormal years, but with the present period, which is one of profound economic readjustment. It is with this pregnant fact before us that a decision must be made."

Tommyrot, say we. When have public utilities enjoyed periods of prosperity and full dividends? The 1917 census of "central light and power stations," the last to be issued, shows that 68 per cent of the total number of incorporated central electric stations, or 71 per cent of all which had outstanding capitalization, paid no dividends at all. The commission seeks to convey to the public the idea that public utilities are veritable gold mines, whereas the facts show them to be poorly paid servants. If, with the rates of return limited, deficits are never to be made up, heaven help the industry! Regulation then becomes confiscation. Fortunately we operate under a constitution in this country, and that historic document provides for proper redress. No doubt the commission has overstated the case, but overstatements from such a source and on such a subject do incalculable harm to the public utilities and add nothing to the prestige of the commission.

Running Down False Fire Accusations

IT IS good to see the results that are coming out of the systematic investigation now being made by the Society for Electrical Development into the facts behind each case of fire reported as of electric origin. It has long been the custom of the over-hasty newspaper reporter to blame the fire on electricity if no other cause was discernible. The fire chiefs, not liking to admit ignorance of fire causes, have done the same. The underwriters have rattled the bones and waved the crape continually, accusing electricity of appalling aggregate fire losses, when as everybody knows electric service in every building that it enters banishes other fire hazards infinitely more dangerous. If it were not so, the fire insurance man would not use it in his own home. But the combined influence of all this has been a drag on the electrical industry.

In a recent issue of the S. E. D. monthly publication, *Do It Electrically*, there is a report on twenty-seven cases of fire reported from different cities as of electric origin, the causes being variously classified as defective wiring, cross wires or short circuits. The society communicated with the local central-station company and the fire chief in each instance and found that in these twenty-seven cases, with an approximate loss reported as $1,637,525, only three fires could possibly be blamed on the wiring. In one of these cases there was doubt. The twenty-four other fires admittedly were clearly chargeable to other causes, but the newspapers had blamed them on the wiring.

It will take a long while to cure the newspaper reporter of this bad, careless habit. It will take some time to make the fire chiefs appreciate that loose testimony of this kind does serious injury to an industry that in reality is the greatest ally of the fire fighters. But how long it will take will depend much on how well the central stations of the country co-operate with the Society for Electrical Development in running down these false fire accusations, themselves exerting every possible influence to set the matter right in the minds of the fire people, the newspaper men and the public.

The Radio Telephone as an Operating Asset

THE rapid development of radio telephony in the past few months has brought with it a tremendous interest in the use of radio for central-station operating purposes. This interest has been intensified in some sections of the country by the occurrence of severe sleet storms which not only tore down light and power lines but temporarily paralyzed communication by wire for periods ranging from a day or two up to a week or more. Restoration of service was seriously hindered in many instances because owing to impassable roads there was no means of finding out just what had happened, especially in some of the smaller communities, and it was therefore impossible even to make plans for reconstruction work.

The fundamental problems that confront the central-station experimenter with radio telephony are hard to determine. This is very largely due to the fact that even the more experienced radio operators are not yet out of the experimental stage of development and every day brings some new and previously unheard-of experience. In addition, the present unprecedented development has been made under the legal regulations and the governmental control that were established for radio telegraphy. The radio telephone has advanced so rapidly that these regulations have not been able to keep pace with it. In truth, it is difficult to say at the present moment what the new regulations should be. Added to this is a patent and manufacturing situation that for a number of reasons seems to be chaotic.

One of the principal things that the experimenter must realize is that there is serious traffic congestion in the air and that no one class of users can expect to have the ether to do with as it wishes. In the present state of the art, even with the best of regulations, it will be necessary for every one to do a large amount of giving and taking in the effort to get results. Unless the experimenter is prepared to take part in much good-natured controversy, as well as to make many trials with the apparatus itself in the effort to develop a practical installation and get it on a satisfactory operating basis, he had better keep away altogether. If he is prepared to go to the necessary trouble, there is ample promise of the development of a means of communication that will admirably supplement present methods. Incidentally the experimenter will take a part in one of the most fascinating studies that have ever engaged popular attention.

Interdependence of Engineers and Sales Forces

SPECIALIZATION of work in electric utilities of even medium size has been proved to be sound in theory. Its practical limitations show up, however, when there is evidence of indifference among employees as to the tasks of other departments than their own. It has been the fashion in some circles to overemphasize the differences between engineering and sales activities. Post-war economic pressure is beginning to drive new conceptions of mutual dependence into the receptive minds of progressive utility employees and to focus more sharply upon the screen of executive attention the need of team play between engineers and the sales forces.

Why the Hesitancy in Adopting Three-Phase, Four-Wire Distribution?

IT SEEMS hardly necessary to dwell upon the theoretical advantages of the three-phase, four-wire system of distribution, but there seems to be considerable need for encouraging its more general adoption. Very few operators will refuse to admit that the three-phase, four-wire system would work out very satisfactorily for their local conditions. They agree that considerable increase in line capacity can be obtained, that the line losses will be reduced to a large extent, that the regulation will be better, that advantage can be taken of the diversity factor more effectively, and that extensions of an existing system can be made more readily. Sometimes the change can even be paid for by the savings of the first year.

Despite all the foregoing benefits, we find many companies hesitating to take advantage of the system of distribution that for any given voltage is the most economical from the distribution-line point of view. Two principal obstacles seem to be in the way—first, the required changes in the substation arrangement and equipment; second, the changes on the underground lines or the overhead lines of the system. Neither of these obstacles is insurmountable; in fact, with careful study of conditions it will usually be found possible to accomplish the changes without much difficulty or much chance of impairing the service during the cut-over. It should not be forgotten, either, that the adoption of a three-phase, four-wire system is a step in the right direction toward distribution economy, though it may seem to promise relief of overloaded conditions for only a short period of time. Future steps to take care of increased loads will be facilitated, whether they are taken in the direction of increasing the distribution voltage or installing numerous automatic stations. In either case the most effective system of distribution will be available to handle the load requirements.

Foreign Financing a Source of Trade

LAST year more than $210,000,000 of Latin-American loans were financed in the banks of the United States. The greater part of this money was required for the construction of public works and therefore used for reproductive purposes. Here is a factor in the foreign trade situation that deserves considerably more interest and attention from the American manufacturer and the American engineer than it has commonly received. For though trade follows the flag it also follows the way of a nation.

If there is one thing that stands out clearly and impressively in the articles on the export outlook, the second of which appears in this issue, it is the vastness of the opportunity for engineering development in South America. The country is huge and the population is large. The desire for more of the material comforts of modern life is growing steadily and calling for the development of natural resources and public utilities. The engineering problems involved are very like our own, and we stand in a position of particular fitness and opportunity both to assist with the work and to furnish the things needed for doing it.

Here, then, is one of the obvious natural paths to follow in the upbuilding of trade with South America. We must encourage the Latin-American student to come to our technical schools and study American engineering and American industries. We must aid in the outfitting of South American technical schools with our apparatus, equipment and data. For this will bring better understanding of both our principles and our practice and a greater inclination among the peoples of the southern continent to come to our banks for money to finance their construction projects, and this money will be spent in large part for American products. Public opinion in this country should be energetically fostered in favor of these foreign loans for reproductive purposes in public works where American specifications will provide a natural demand for American goods.

Promoting "Club Life in Business"

THE phrase "club life in business" seems to strike right to the point when it is applied to the character of many of the present-day meetings of conventions of electrical men. The getting together of a group of men, if the sole result were listening to a number of often dry and generally shopworn papers or speeches, would be a nearly total loss of time and money. But knock out the stiffness that might be proper in, say, a meeting of the House to impeach a president, and inject into the convention some of the good-fellowship that abounds in a men's club, and the result will be a convention that will send every man away in the right spirit to meet his competitors, or his customers, or the man he buys from. Truly, a hearty good-fellowship

among competitors profits more than destructive competition and still leaves business free to be divided on the basis of merit and service.

Financier Pleads for Unbiased Engineering Reports

"WHATEVER you do, do not put out a report merely for the money that is offered you," was the plea made by J. W. Perry, president of the Commerce Trust Company of Kansas City, before a recent meeting of engineers interested in oil-field developments. Intelligent and honest reports without any reference to the financing of projects were emphasized as the important thing from the standpoint of the banker. Mr. Perry laid no charges of incompetency or crookedness against engineers that are not equally or in greater degree applicable to others, but the one thing he emphasized in his address was the unusual responsibility that rests upon the engineer who must make recommendations on new projects. On those recommendations decisions that involve not only financial expenditures but the welfare of a business enterprise, or perhaps the entire welfare of a community or a state, are made. The consequences of incompetency or dishonesty, even though such cases be no more frequent than in any other line of endeavor, are farther-reaching, and therefore the responsibility of the individual on whose recommendations action is taken is the greater.

The old saw that a physician buries his mistakes but the mistakes of an engineer bury him may have been purely humorous in conception, but it carries a thought that no engineer who is sensible of the importance of his profession can afford to forget even for a moment.

Reclaiming the Abandoned Residence District

ONE of the sad and wasteful features of our modern city living is the very common strangulation of once prosperous residence districts. Whole squares of worthy houses, thirty years ago the center of the social life of the community, have been abandoned for recently developed sections where more modern dwellings give greater comforts. The former owners suffered the early stages of the depreciation and sold at a sacrifice to follow the progress of social migration. The present owners rent these properties to any one at the highest figure they can get, neglecting maintenance and intent on squeezing out the last cent regardless of the impending fate of the locality. So men sit back and say that such sections are doomed as though these houses suffered from some fell disease. But as a matter of fact they are simply starving—starving for electric lights and gas ranges and bathrooms and new paint.

The reclamation of these abandoned residence districts offers a very big and profitable opportunity to the central-station company that is enterprising enough to develop such a project in co-operation with the local plumbers, painters and decorators, the owners of the properties and perhaps the banks. Some of the most substantial, comfortable and conveniently located homes in almost every city are found in these old-fashioned quarters. Taken individually it is impossible by interior improvements to restore their prestige and their popularity, but in an operation that embraces solid blocks and squares it is another matter. And it is necessary but to do the job and advertise it to repay the owner with much profit through the increased rental value of the premises. Meanwhile the contractors will benefit through the work, the central-station company will gain new customers of better character, the banks will loan their money well, the community will gain distinctly, and many home seekers will be provided with abiding places of a good old character with far less expenditure of money and less delay than building an equal number of new houses would entail.

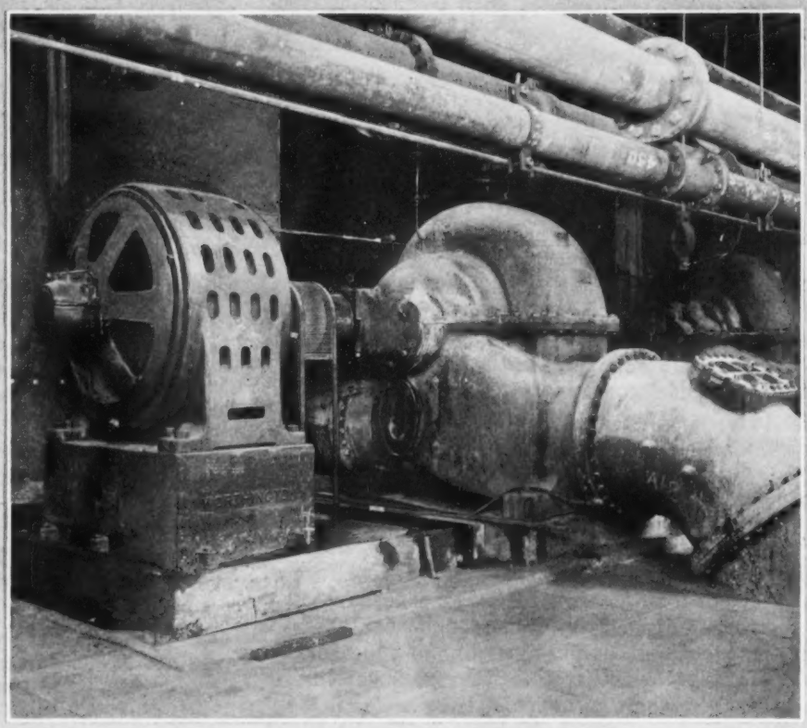
Commercialization of Gas Turbine Would Revolutionize Power Plants

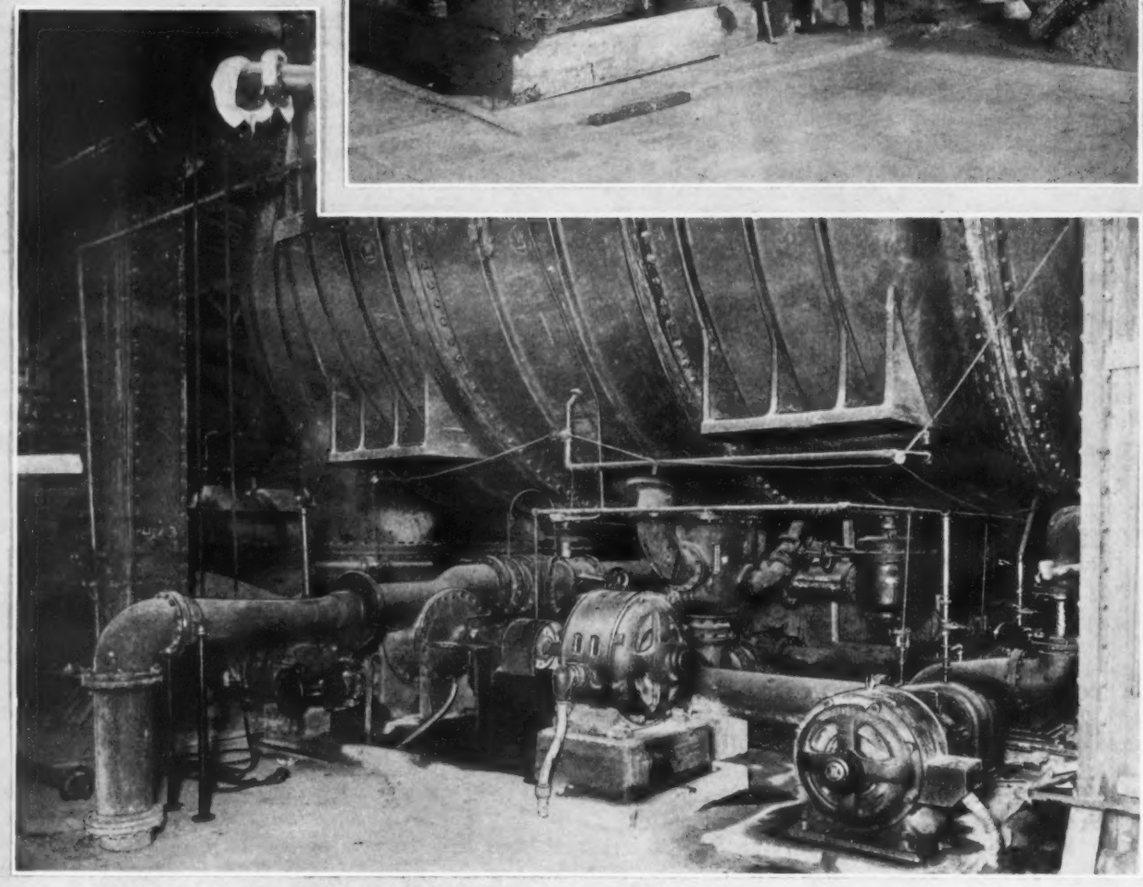
NOT many years ago the gas engine of the ordinary four-cycle type or the Diesel engine of somewhat equivalent character seemed likely to make a considerable impression on central-station practice, particularly in the function of reserve auxiliary apparatus. As time has gone on and the steam turbine has gradually undergone evolution, it has reached a degree of economy quite unknown in its earlier stages, and consequently we are hearing less about internal-combustion engines. Instead, the efforts of inventors have been steadily directed toward producing a gas turbine which should have the light-load characteristics due to small friction that are so desirable and a degree of economy at least comparable with that of the reciprocating internal-combustion machine.

The difficulty of getting a system of virtually continuous combustion which will keep the gas turbine up to speed and which can be governed well enough for electrical service is no small matter, but a far more serious difficulty is the requirement of high compression in the internal-combustion engine as a prerequisite for high degree of economy. Compression by reciprocating machinery runs into the very difficulty of high friction which the engineer desires to avoid, and rotary compressors of sufficient pressure capacity have not yet been produced. The long and short of the matter is that the negative work of compression looks for the present too big to permit of a respectable rivalry with the reciprocating type of gas engine, let alone the steam turbo-generator. There should be a way out of these difficulties, but it has not yet been found as regards the straight internal-combustion turbine. An interesting flank movement has been made in mixed turbines, where the heat of the combustion chamber is in part utilized to raise steam to add its store of energy, and the field of using the exhaust gases has also been to some extent explored.

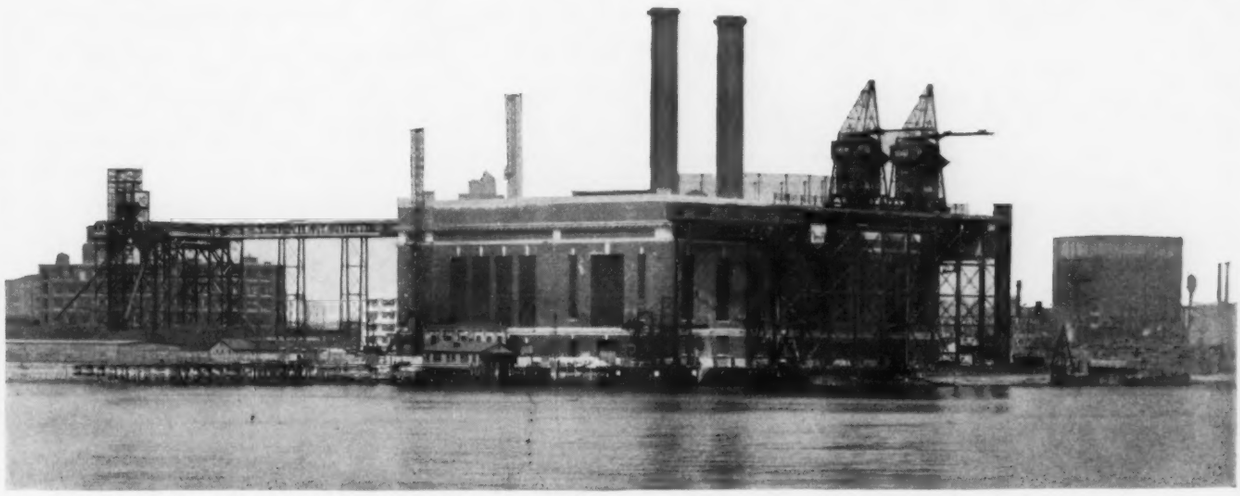
It is going much too far to talk about the impossible in heat-engine development, and some scheme as yet untried may lead to at least a limited solution of the gas-turbine difficulty. One must, however, emphasize the fundamental limitation that is imposed by the peripheral speeds necessary for efficiency when one is dealing directly with the gases from internal combustion. The situation is bad enough with steam as the practical limits of temperature range are approached. It is much worse with the temperature range reached with internal combustion, upon which, of course, in the last resort improved efficiency depends. Commercialization of the gas turbine would bring about some startling changes and would shake up standardized power-station engineering in a way almost shocking to contemplate, so the developments which have been reported in Germany will be watched with intense interest.

Each Condenser in the Hell Gate Station Draws Circulating Water Directly from the East River





EXPENSIVE excavation and construction of concrete intake tunnels for the circulating water was avoided in the new Hell Gate station of The United Electric Light & Power Company by connecting each condenser directly with the East River, which flows along the east side of the station site. It was possible to make these connections very short by placing the turbine room next to the river. This arrangement required placing the boiler room between the turbine room and the electrical galleries, contrary to usual practice. However, this proved no disadvantage as in any event a coal-car cableway had to be run over the top of the boiler room to convey coal to outdoor storage, accommodating 100,000 tons.



Hell Gate—A Station of Many Features

With Its Turbine Room Next to the River, Phase Isolation of All Electrical Equipment and Alternating-Current-Driven Auxiliaries, This Station of The United Electric Light & Power Company Is Unusual

IN DEPARTURES from conventional practice and as representing the latest word in power-plant construction, the new Hell Gate station of The United Electric Light & Power Company easily takes the lead among generating stations completed in the last six months. For a station of its rating (300,000 kw. ultimate) its construction was completed in remarkably short order, four turbines, with a combined rating of 150,000 kw., having been placed in service within one year from commencement of the steel work. Hell Gate is also interesting because it will serve as the base-load station of the entire 60-cycle system shown in Fig. 3.

Among the features which make Hell Gate station stand out as an unusual plant are the following. The turbine room is next to the river, with the boiler room between it and the electrical galleries; alternating-current-driven auxiliaries are used, with one or two exceptions; phase isolation of all electrical equipment has been carried out; the ashes will be sluiced by hydraulic means; the station equipment has been divided into four independent groups, and heat-balance control is provided. The large outdoor coal storage, the arrangement of condenser circulating-water intakes and discharge, the use of boilers with superheaters only six tubes above the combustion chamber, the extensive equipment of motor-operated valves, the truck-type switchboards for station service and the coal-handling facilities are also worthy of note.

The need for this new station is readily evident from the accompanying chart (Fig. 1) showing the growth in 60-cycle peak load and the combined operating rating of the generating stations serving this load.

Considerable thought and time were given to the selection of a proper site for the new plant, the chief factors influencing its location being center of load, condensing water, coal supply and storage, and realty values. The site, shown in Figs. 3 and 5, combines in a quite unusual way all of the desirable features for the location of a tidewater plant.

The center of load of the United system is within reasonable distance of the new station (see map), and future growth of the load during the next few years should tend rather to diminish than increase the distance. The plant has an unlimited supply of fairly clean condensing water, the temperature of which rarely exceeds 75 deg. Fahr. Furthermore, the water is cleaner at the plant site than at most places along the East River.

By excavating the river to a depth of 35 ft. (10.5 m.) along the bulkhead it has been made possible to bring

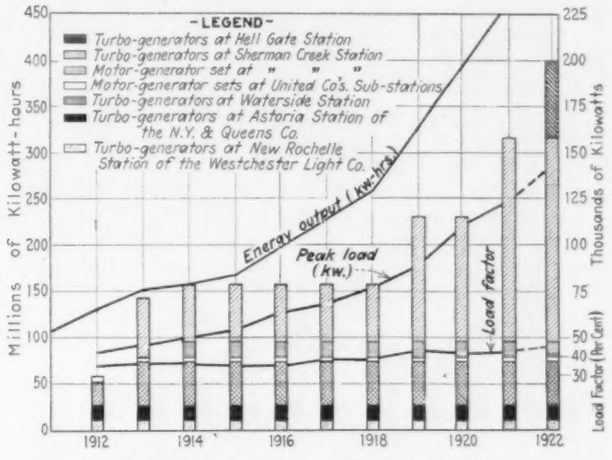
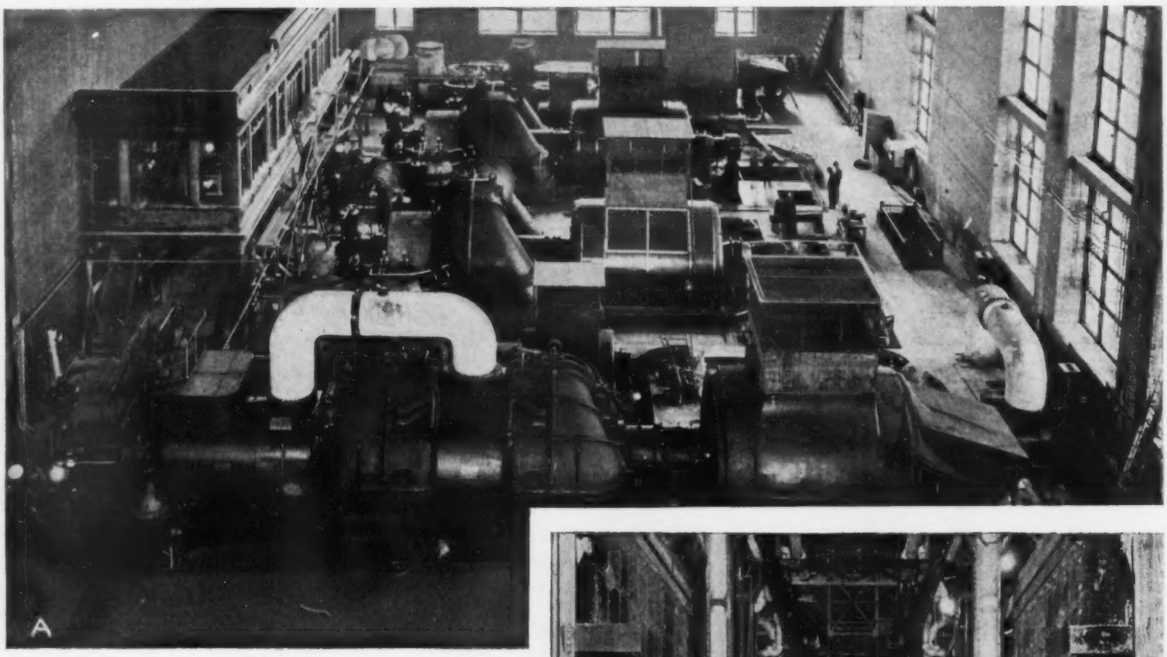


FIG. 1—GROWTH OF 60-CYCLE PEAK LOAD AND ANNUAL OUTPUT WITH CORRESPONDING GENERATOR RATING

From a peak load of only 40,000 kw. in 1911 the 60-cycle load has increased to more than 135,000 kw. peak and the annual output to nearly 550,000,000 kw.-hr. In the last few years the demand for service on two occasions almost overtook the operating rating of the system (that is, the combined 60-cycle rating of all plants minus the rating of the largest 60-cycle unit on the system), hence the need of the new Hell Gate station. Judging by the past increase of load, another 60-cycle unit may be required in Hell Gate in 1923. While the United company's system is essentially 60-cycle, Sherman Creek and Hell Gate stations have a combined 25-cycle rating of 110,000 kw., energy being supplied at this frequency to the New York Edison Company and the New York, New Haven & Hartford Railroad.

Turbine Room, Boiler Room and Condenser Floor Jointly Occupy 0.419 Sq.Ft. per Kilowatt of Rating



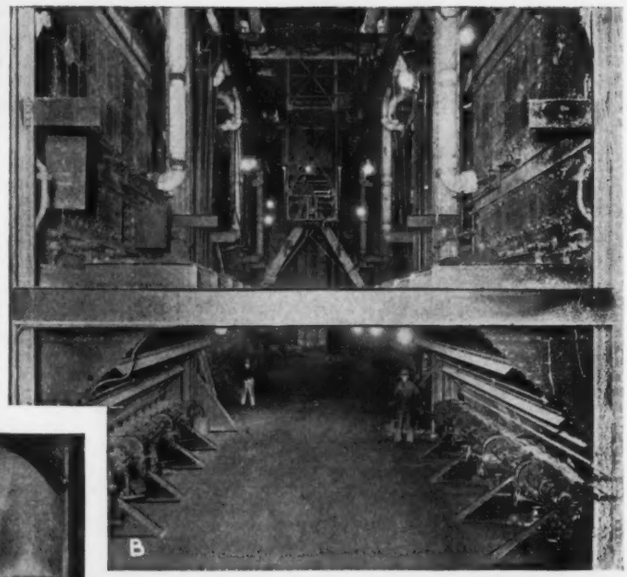
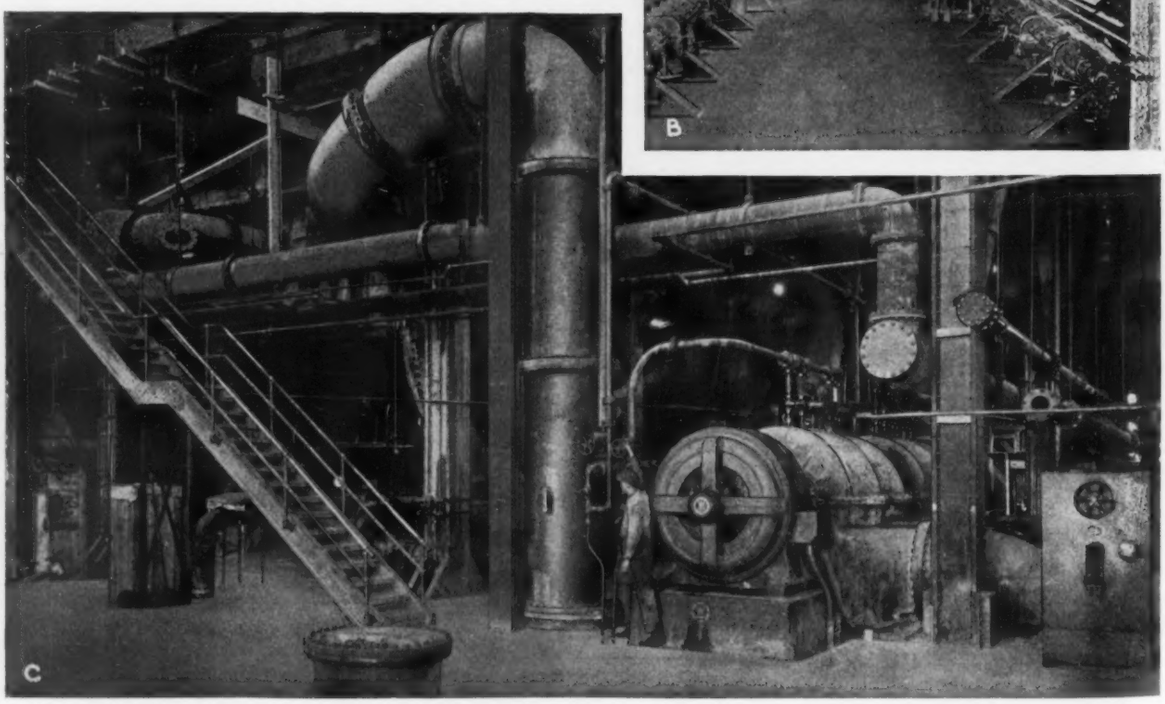


Fig. 2—Owing to the haste with which this plant had to be put into operation considerable clearing up still has to be done before it will be in shipshape condition. Despite the unfinished appearance, however, the illustrations are interesting as showing the turbine layout (A), double-end fired boilers (B) and condenser pumps (C) connected directly with the river. One 25-cycle and one 60-cycle turbo-generator with a house generator between constitute a group served by six boilers. Heat balance is maintained from the balcony on the left of the turbine room. The coal lorry in (B) serves the stokers on facing ends of six boilers and is charged from a bunker at this end. In (C), at the left, is one of the condensers with the circulating-water discharge curving and running down to the discharge tunnel vertically. The atmospheric relief valve is on the left.



oceangoing coal boats directly alongside the station for unloading by means of the coal towers. In addition, a direct siding from the New York, New Haven & Hartford Railroad permits the receipt of coal by rail—a feature possessed by Hell Gate alone among the generating stations in New York. The existence of two independent routes for bringing coal to the plant is of tremendous value in view of the absolute continuity of service that must be maintained on the system. The Hell Gate site possesses a further safeguard in this respect in having an outside storage capacity of approximately 100,000 tons, which insures about four weeks' operation at the utlimate load in case all the other sources of coal supply are cut off.

Contrary to the usual practice of placing the boiler house next to the river, Hell Gate station is constructed with the turbine room alongside the waterfront, while adjoining it on the land side is the boiler room. The electrical galleries are still farther inland, between the boiler room and the outdoor coal-storage space, being separated from the boiler house by a gap of 25 ft. (7.5 m.). With this arrangement it was made possible to dispense with expensive excavation and tunnel construction for the condenser circulating water since each condenser can draw its circulating water through short intakes directly from the river. Screens are installed along the entire river front of the station, thus providing considerably more screening area than is usually available in power plants. The discharge tunnel runs parallel with the river and empties into it near the upstream and downstream ends of the turbine room. This tunnel was constructed as a part of the station foundation, and provision was made for partitions so that half of it may be dewatered for repairs.

Unusual Layout Imposes No Limitation

Placing the boiler room between the turbine room and the electrical galleries has imposed no limitations on the boiler house because a cableway had to be run over the boiler house in any event to convey coal to the outdoor storage yards back of the plant. Normally coal will be brought to the station from the South in 10,000-ton seagoing barges, which will be tied up to the bulkhead and unloaded by electrically operated traveling coal towers mounted on a structure 130 ft. (40 m.) high. Each tower (two being provided) is rated at 250 tons per hour, a 2-ton grab bucket lifting the coal almost 200 ft. (61 m.) and dumping it into a hopper over the cable railway. After being crushed the coal is dumped into cable cars and weighed on automatic track scales, the cars continuing along the loop over the boiler house or coal-storage yard as desired. Automatic trippers dump the cars into overhead bunkers in the boiler house or into chutes that discharge into the coal-storage yard. To distribute the coal a drag-line scraper is employed.

Provision is also made for bringing coal to storage by rail, weighing on track scales, unloading by a locomotive crane and distributing over the storage space by the drag-line scraper previously mentioned.

Coal is reclaimed from storage by using the same scraper to drag the coal into a hopper below the elevated cable-car loop. From this point an automatic skip hoist elevates the coal to the cable cars, which transfer it to the bunkers in the boiler house.

The existing boiler-house coal bunkers have a total capacity of 1,700 tons, or about twenty-four hours' supply with the station operating at its present rating. These bunkers extend along one wall of the boiler house only. Running at right angles to them over each firing aisle are traveling lorries which transfer the coal to the stoker hoppers. Each boiler is double-end-fired and each stoker hopper has a capacity of 15 tons; thus, with the arrangement provided, no interruption to any one part of the coal-handling equipment should seriously handicap the station. The capacity of the lorries is such (25 tons for the double-aisles and 15 tons for the single-aisles) that each can serve all stokers along the corresponding aisle by making one trip per hour.

The boiler house measures 147 ft. x 370 ft. (44.8 m. x

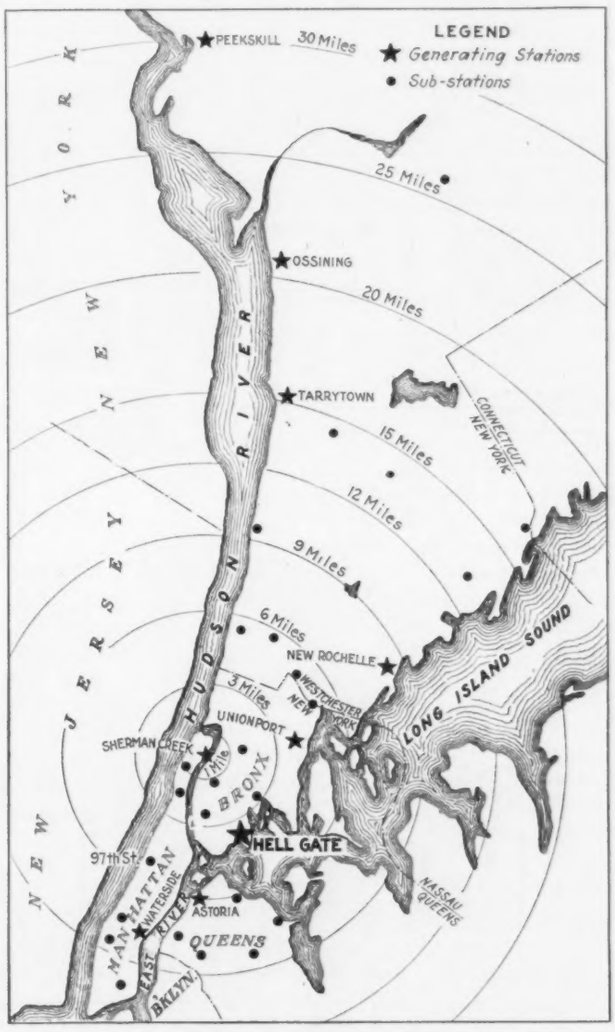


FIG. 3—GENERATING STATIONS AND SUBSTATIONS INTERCONNECTED WITH HELL GATE STATION

The present center of the 60-cycle load is approximately at the Ninety-seventh Street substation, which is the latest substation of The United Electric Light & Power Company.

112.7 m.), thus allowing 0.181 sq.ft. (168 sq.cm.) of floor area for boilers per kilowatt of generator rating installed. The boilers are arranged in rows of three across the narrow dimensions of the boiler house and are set singly. Two rows constitute a unit serving two turbines and having one smokestack. However, five boilers can carry the full load of two turbines, so that one unit can always be kept out of service.

The boilers are of the cross-drum, horizontal water-tube type with the superheater placed close to the combustion chamber, that is, just six tubes above the furnace. One advantage of this construction is the

Hydraulic Sluicing of Ashes a Feature of the Boiler Room

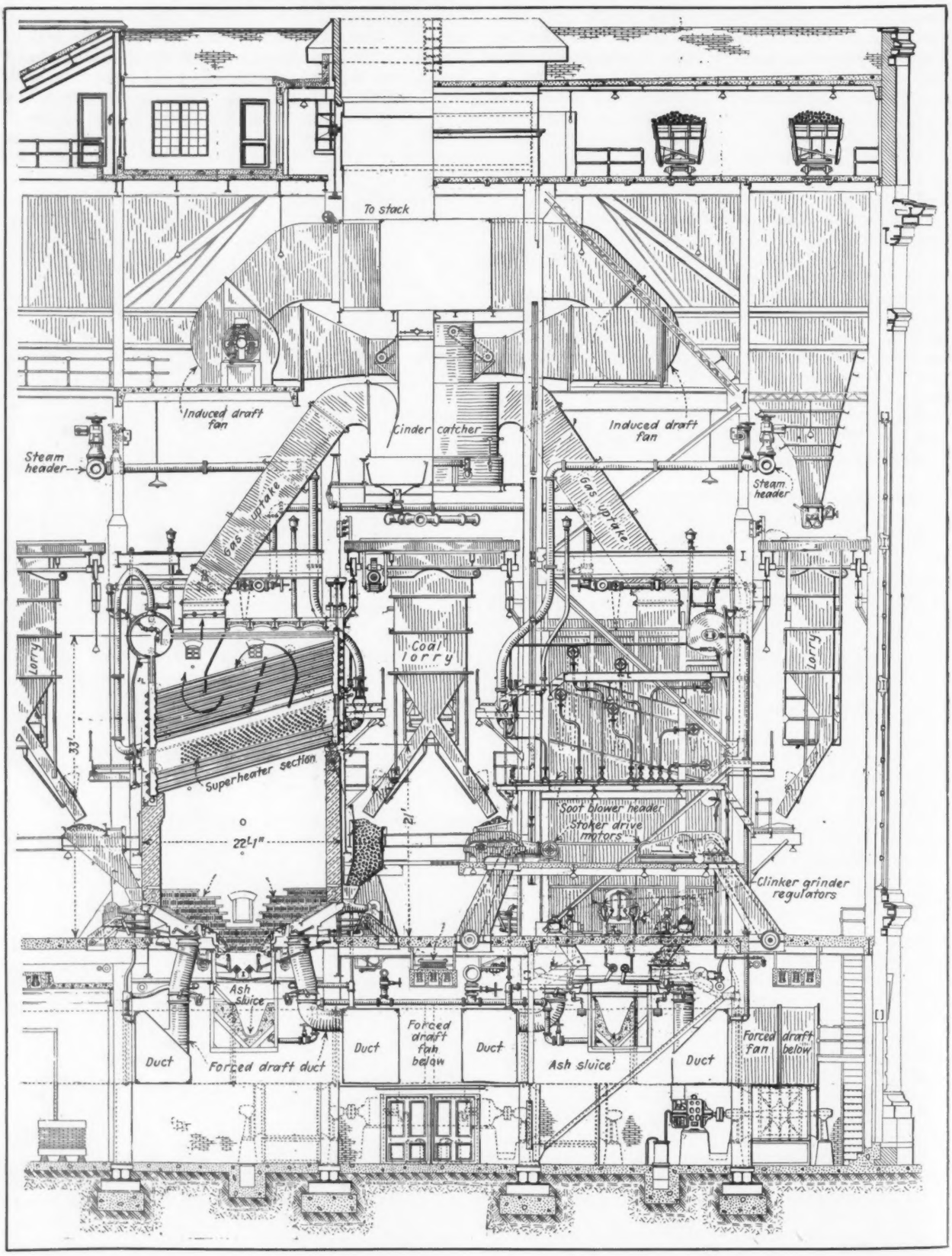


Fig. 4—One of the features of this boiler room is the hydraulic sluicing of ashes. Troughs run directly under each set of clinker grinders to a common header that discharges into under-water storage pits situated as shown in Fig. 5. Among other things of particular interest are the coal-handling arrangements, position of superheaters, types of boilers employed, the perforated blocks, use of double stokers, the cinder catchers and the absence of steam drive. The stokers, clinker grinders and fans are driven by motors, the stokers through double-cone drive, and the forced draft fans by brush-shifting motors. There is one coal lorry for each firing aisle, which receives its charge from a large overhead bunker along one side of the boiler room. It is filled by the cable cars above. The type of boiler employed allowed placing the superheaters above the sixth row of tubes. The cinder catchers, which are of the deflector water-pool type, are mounted back to back, as shown above.

more uniform superheat obtainable. Another feature of the boiler is the small tubes used, namely, 3-in. (7.6 cm.), which increase the steaming rate and reduce the hazard from tube failure. Each boiler is built in twenty-seven sections, fifty-four tubes wide and twenty high, making a total heating surface of 18,900 sq.ft. (1,738 sq.m.). Steam is generated at 250 lb. pressure (19.25 kg. per sq.cm.) and 200 deg. Fahr. superheat.

Two fourteen-retort stokers are installed under each boiler so no bridge wall is necessary. Perforated blocks are built into the furnace side walls to admit air and thus prevent adherence of clinkers. Air for these ducts as well as the stoker tuyères is provided by forced-draft fans installed in a basement room extending along the outside wall of the station. By providing ample air inlets to this room it has been possible to avoid creating a vacuum—a very objectionable condition because it has the effect of reducing the stack height and in addition draws a lot of cold air into the station in the winter. The fans discharge into a single air duct running the length of the station under one end of each row of boilers. Branches from this main run under each row of stokers. Between each pair of fans in the main duct is a damper which is normally kept closed so that each section of the duct, with its corresponding two fans and two branches, serves as a unit for one row of boilers. Any damper can be opened if necessary, permitting adjacent sections to be fed from three blowers in case one becomes inoperative. This arrangement permits very flexible operation and still preserves the unit layout which is characteristic of this plant.

The furnace gases, after making three passes over the boiler tubes, go through an uptake to a deflector type of cinder catcher. From this they are drawn through an induced-draft fan and discharged into the stack. Since the induced-draft fans are not required except at heavy loads, bypass dampers are provided above the cinder catchers to admit the gases direct to the stack. One induced-draft fan serves each boiler.

Instead of providing large ash pits under each furnace and having cars to remove their contents, a tile-lined concrete trough is run under each row of furnaces, immediately below the clinker grinders, and connected with a main trough that leads to settling pits at the bulkhead. Water is supplied to this trough by centrifugal pumps through nozzles at each boiler.

The sluiceways are open along the top so that they are easily accessible if anything tends to clog them.

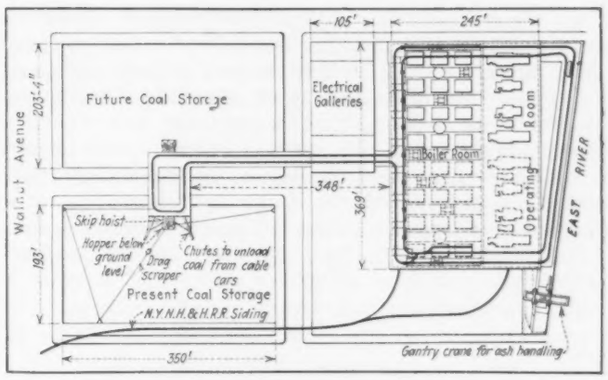


FIG. 5—STORAGE SPACE BACK OF PLANT ACCOMMODATES APPROXIMATELY 100,000 TONS OF COAL

However, no difficulty is expected as the discharge from the clinker grinders can be easily carried away by the water at the rate it is discharged through the troughs. For removal of the ashes from the settling pits a crane and grab bucket are provided that can directly load scows at the bulkhead or motor trucks.

Provisions for assuring flexible and reliable water feed to the boilers and steam feed to the main turbines, house turbines and two boiler-feed turbines are best shown in Fig. 7. It may be observed that each group of six boilers is fed by a loop header supplied by three boiler-feed pumps, two of which are motor-driven and one turbine-driven. Two of the pumps are capable of serving a boiler group at maximum load. Make-up water will not amount to more than 2 per cent of the total water used, but three independent sources of city water are provided to assure a reliable supply. Continuity of feed is further assured by connections between each group header, the valves being normally closed, however. There is a flow meter in each side of the loop header, and thus any pump may be tested. Two automatic feed regulators are on each boiler.

Although each group of six boilers is considered a unit in feeding two turbines, the headers along each row of three boilers run directly to the corresponding turbine. Interconnection is afforded by a cross-header running the entire length of the boiler room and joined with each individual boiler header. The valves between groups are normally closed. The house turbines, boiler-feed-pump turbines, house-turbine exciters, air ejectors on the condensers, fire pumps, whistles, etc., are fed

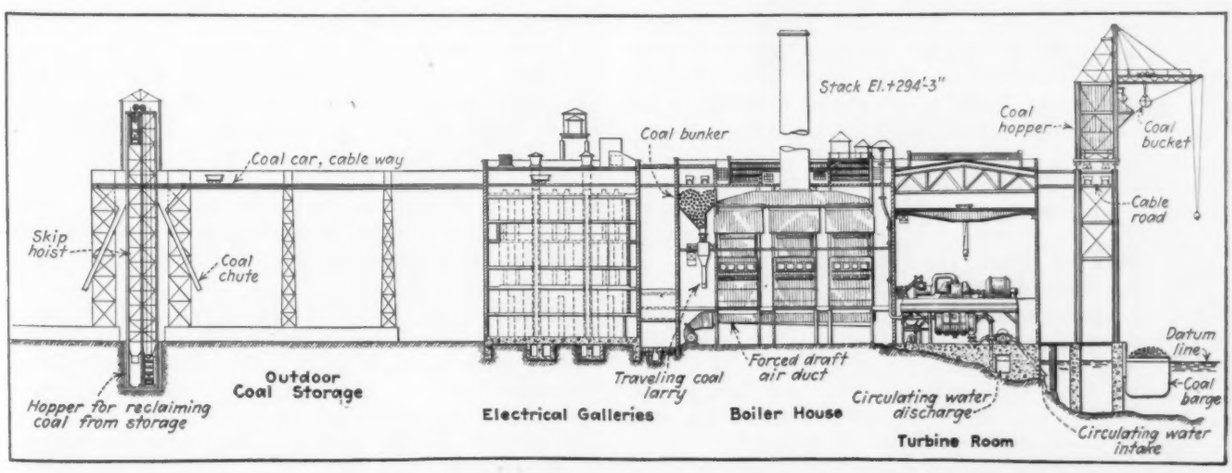


FIG. 6—CONTRARY TO USUAL PRACTICE, THE BOILER ROOM IS BETWEEN THE TURBINE ROOM AND ELECTRICAL GALLERIES

from the cross-header. Attention is called to the extensive provision of steam-flow meters and motor-operated gate valves. By having flow meters in both outlets of each boiler it will be easy to ascertain the distribution of steam between the two connections and hence to become aware of the sticking of either non-return valve.

An excellent idea of the layout on the turbine floor and the relative positions of the equipment under the turbines is afforded by Figs. 2A and 2C. Space is provided for four 35,000-kw., 25-cycle, 11,400-volt turbo-generators and four 40,000-kw., 60-cycle, 13,200-volt turbo-generators, but only two of each type are provided now. Since the turbine room measures 98 ft. x 364 ft. (29.8 m. x 110.9 m.) a floor area of 0.119 sq.ft. (110.5 sq.cm.) is available per kilowatt of ultimate rating.

The 35,000-kw. turbines are of the Curtis type, having twenty stages, and the 40,000-kw. turbines are of the tandem-compound reaction type. The high-pressure element of the latter is of the Parsons single-flow design, and the low-pressure element is of the semi-double flow design with two exhaust outlets. Each turbine exhausts

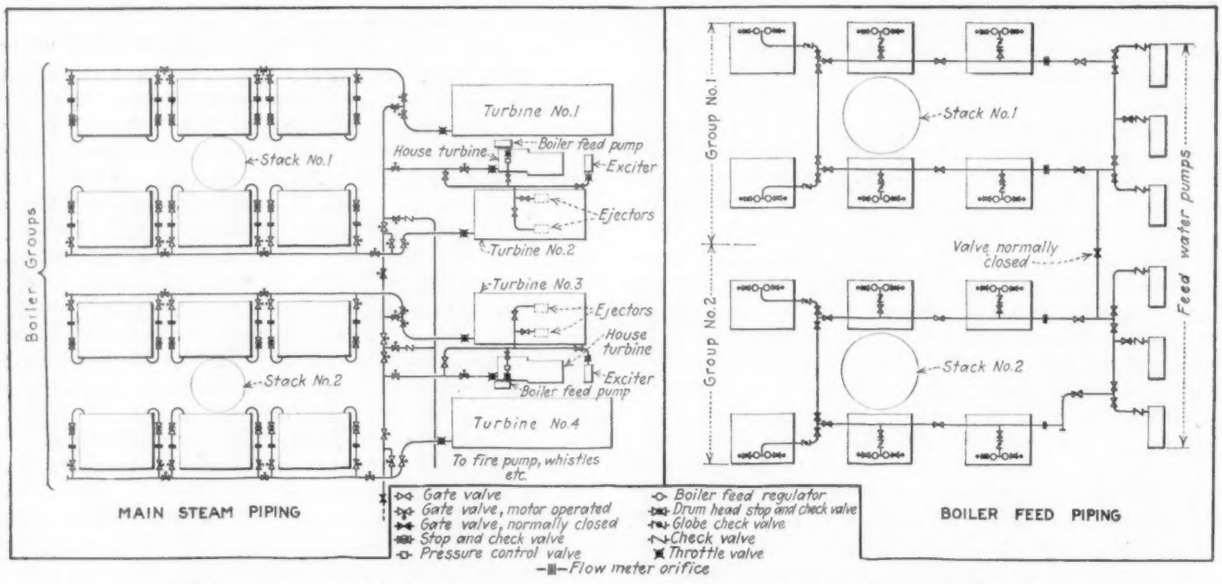


FIG. 7—STEAM AND BOILER FEED PIPING THAT ASSURES MAXIMUM FLEXIBILITY OF OPERATION

into a 50,000-sq.ft. (4,600-sq.m.) surface condenser, rubber expansion joints being used between the turbine and condenser of the 40,000-kw. sets, and direct connection between the others. Expansion joints have been omitted in the 35,000-kw. sets because the condensers are supported on springs. Both types of condensers have divided water boxes which enable cleaning to be done without shutting down the units. Separate intakes and motor-driven circulating pumps serve each half of each condenser, although a cross-over connection may be opened if necessary. As mentioned at the opening of this article, the intakes are very short and connect directly with the river. (See page 820.)

Duplicate motor-driven condensate pumps are connected with each condenser. For removing air from the 35,000-kw. condensers four two-stage steam-jet air ejectors are used, whereas for the 40,000-kw. units duplicate Le Blanc air pumps are employed. Any of the duplicate pumps can carry the entire load of the unit unaided with only slight reduction in efficiency.

In considering the various systems of auxiliary drive available it was decided that the best combination of reliability, economy and ease of maintaining heat balance would be obtained by adopting alternating current for all auxiliaries except one boiler-feed pump of each group, one of the two exciters for each house alternator, and the fire pump. One-half of the load is carried on the main 60-cycle bus and the other half by the house alternators, so that in case of interruption of either source of power only one-half of the auxiliaries will be shut down. One house alternator is installed for each group of six boilers, two main turbines (25-cycle and 60-cycle) being placed between the latter. The house alternators generate at 2,300 volts and are driven by non-condensing turbines. Any of the auxiliaries except the coal tower, cranes and skip hoist may be connected to either bus by truck-type switches.

Heating of the feed water also is conducted on the unit or group plan, being accomplished as follows: The condensate from the two main condensers divides and passes through two closed feed-water heaters, both of which are heated by bleeder steam obtained from the main turbines at 6.5 lb. absolute pressure (0.4 kg. per sq.cm.). After being raised to 150 deg. Fahr. the main unit condensate leaves these heaters and enters an open feed-water heater which receives steam from the house alternator turbine and high-pressure packing of one of the main turbines. The condensed bleeder steam from the closed heater also passes through the open heater with the other condensate and is raised to 210 deg. Fahr. before being pumped to the boilers. Thermostatically controlled valves equalize the load on the two closed heaters. To insure a sufficient supply of steam to the open heater at all loads of the house alternator, steam is bled from the intermediate stages of the main turbines through pressure-control valves set for 1 lb. (0.07 kg.) back pressure.

Make-up water from the surge tank is first passed through oil coolers and condenser-air ejectors to a receiving tank, from which booster pumps deliver it to the closed heaters. From this point on the course is the same as for main-unit condensate. Since the surge tank receives all the water used in cooling the bearings of the induced-draft fans, etc., the foregoing method of handling the make-up water, steam and condensate

conserves all the heat from various sources. Virtually the only manual regulation which will be required for obtaining the proper heat balance will be the control of the forced-draft fans, which will be operated by push-button switches on a control board overlooking the turbine room (see balcony at left in Fig. 2A). All auxiliaries are controlled from this point. The induced-draft fans after being manually started are regulated by an automatic balanced-draft system. Very complete instrument equipment is provided to enable economical operation. Each boiler is equipped with a meter recording steam flow (through both outlets), air flow and flue-gas temperature on a single chart and indicating the steam flow and firebox draft on enameled scales.

On the heat-balance balcony overlooking the turbine room are additional instruments divided into groups, each set serving six boilers, two main turbines, one house turbine and the corresponding auxiliary equipment. The instruments are arranged in three horizontal rows. Considering one section of the board only, the top row includes two three-pointer draft gages (one for each row of boilers in the group), one exhaust-steam temperature recorder connected with the atmospheric exhaust line to detect loss, a city-water make-up recorder, and a feed-water temperature recorder. In the middle row are temperature recorders connected with each of the main throttles, air-pressure recorders connected with each forced-draft duct, a steam-pressure gage indicating the average condition in main header, and three ammeters connected to each induced-draft fan to indicate relative load. In the bottom row are recorders for measuring the condensate from each condenser, the feed water to each row of boilers, and the main steam pressure and feed-water pressure (on one instrument). In addition three ammeters are connected with each forced draft fan.

The design and construction of the Hell Gate station was carried on under the general direction of Thomas E. Murray, Inc., engineers, working in co-operation with an active construction committee made up of a large group of central station engineers from the allied electrical companies of Greater New York. Through these sources and the co-operation of Frank W. Smith, vice-president and general manager of The United Electric Light & Power Company, this article and one on the electrical features, to follow, were prepared.

Five Systems with an Output Over 1,000,000,000 Kw.-Hr.

"Electrical World" Survey Indicates that in 1921 Seventy-two Light and Power Companies of the United States and Canada Reported Individual Output Exceeding 100,000,000 Kw.-Hr.

A SURVEY just completed by the ELECTRICAL WORLD indicates that five electric generating and distributing companies of the United States had an output of more than 1,000,000,000 kw.-hr. during 1921. Canada was unrepresented in this group. In 1920, as was indicated by a tabulation appearing in the April 23, 1921, issue of the ELECTRICAL WORLD, nine companies in the United States and Canada reported an output in excess of 1,000,000,000 kw.-hr.

A study of the accompanying tables brings out some interesting results of the campaigns which the various generating and distributing companies have undertaken to find a market for their excess energy resulting from the industrial depression and consequent decrease in the power energy load. During 1921 the Commonwealth Edison Company of Chicago added approximately 40,000 new residential lighting customers to its lines. As a direct result and notwithstanding the loss of a large precentage of its power load, the output of this company was increased by 44,701,943 kw.-hr. over 1920, and in 1921 it leads the list of distributing companies in total output. Similar favorable deductions may be made from the output of other large companies. On the other hand, some companies which serve an intensely industrial section in which a material increase in the domestic lighting load was impossible or was not seriously undertaken reported a largely reduced output for 1921. For instance, the Niagara Falls Power Company carries an industrial load only, having no lighting load except such as is incidental to the power load. This company was totally unable to increase its energy market by an additional lighting load, and as a result its output during 1921 was 473,206,064 kw.-hr. under that of 1920, and it was forced to give way to the Commonwealth Edison Company as the leader in the electric light and power industry, in so far as output was concerned.

Table I is believed to be a complete list of the electric light and power companies and electric railway companies of the United States and Canada with an output in excess of 100,000,000 kw.-hr. during 1921, the table giving also their total output and the amount and date of their peak load. The tabulation also includes data on four companies which fell slightly below the 100,000,000-kw.-hr. mark, but the output of these companies under normal business conditions would exceed this figure.

Table II lists the electric light and power companies and electric railway companies by sections of the country and gives the proportion of the output which was generated and purchased and in addition the distribution of the energy between light, power, electric railways and miscellaneous distribution, the last-named item including intercompany business, line losses, energy sold to other public utilities, etc.

The number of electric light and power companies reporting an output in excess of 100,000,000 kw.-hr. would have totaled seventy-six if the addition of new companies to this classification had not been counterbalanced by the reports submitted by the four companies referred to above which showed a decreased total output. For this reason only seventy-two electric light and power companies and nine electric railway com-

Table I—Data on Output and Peak Load of Largest Generating and Distributing Systems in the United States and Canada

(This table includes all lighting, power and electric railway companies in the United States and Canada having yearly outputs in excess of 100,000,000 kw.-hr.)

	Rank in 1921	1921			1920			1919			1918		
		Peak Load (Kw.)	Date of Peak Load	Yearly Output (Kw.-Hr.)	Peak Load (Kw.)	Date of Peak Load	Yearly Output (Kw.-Hr.)	Peak Load (Kw.)	Date of Peak Load	Yearly Output (Kw.-Hr.)	Peak Load (Kw.)	Date of Peak Load	Yearly Output (Kw.-Hr.)
Commonwealth Edison Company	1	525,640	Dec. 21	1,928,271,943	478,820	Dec. 17	1,883,570,000	428,630	Dec. 15	1,628,340,000	400,010	Dec. 2	1,508,070,000
Niagara Falls Power Company	2	298,120	Dec. 22	1,855,120,000	303,640	Apr. 29	2,328,326,064	275,803	Dec. 29	2,034,608,904	254,139	Apr. 8	2,054,360,080
Pacific Gas & Electric Company	3	265,925	Nov. 29	1,489,088,657	259,004	Dec. 22	1,475,678,673	244,732	.....	1,267,159,767	219,339	.....	1,168,797,446
New York Edison and United Electric Light & Power Company	4	422,721	Dec. 14	1,475,276,053	398,535	12/6 and 12/22	1,383,070,086	330,210	Nov. 25	1,104,521,883	286,103	Dec. 11	958,878,156
Southern California Edison Company	5	238,480	Dec. 13	1,224,718,196	213,450	July 12	1,079,474,091	200,020	July 23	1,021,977,519	163,125	July 12	779,758,000
Montreal Light, Heat & Power Consolidated	6	165,900	Nov. 16	907,231,573	169,450	Nov. 17	900,328,757	164,415	Dec. 16	852,680,550	166,730	Dec. 6	976,462,529
Detroit Edison Company	7	201,500	Nov. 23	897,980,200	218,800	June 16	1,002,306,000	210,000	Dec. 5	872,583,200	172,000	Dec. 13	773,876,700
Philadelphia Electric Company	8	213,570	Dec. 8	877,047,595	203,624	Nov. 23	910,327,693	199,247	Dec. 18	722,615,280	166,294	Dec. 6	693,447,962
Shawinigan Water & Power Company	9	160,500	Dec. 19	863,124,240	192,200	Nov. 17	1,140,759,076	172,900	Jan. 14	1,031,111,695	136,800	Sept. 24	1,058,136,117
Ontario Power Company	10	151,000	Jan. 5	825,115,600	152,000	Dec. 15	1,061,596,054	150,000	Nov. 12	949,223,500	119,000	Oct. 19	963,845,200
Public Service Electric Company of New Jersey	11	213,502	Nov. 28	821,198,975	216,452	Nov. 16	912,899,972	207,890	Dec. 16	821,355,239	185,738	Dec. 5	795,481,279
Southern Power Company	12	218,300	Feb.	790,000,000	210,000	Nov. —	745,873,992	196,500	Dec. —	585,596,925	162,600	Dec. —	551,313,367
Duquesne Light Company	13	164,240	Feb. 1	702,897,985	162,000	Jan. 29	810,401,406	157,900	Dec. 22	623,000,000	141,000	Dec. 6	641,874,585
Toronto Power Company	14	109,000	Nov. 28	630,468,000	109,000	Dec. 21	649,748,800	115,000	Jan. 8	548,477,616	125,000	Dec. 3	897,512,877
Mississippi River Power Company	15	117,450	Nov. 28	602,580,980	115,650	Nov. 13	644,163,000	113,450	Nov. 18	590,488,000	102,950	Mar. 8	557,200,000
Montana Power Company	16	116,600	Jan. 11	572,277,989	159,700	Aug. 7	1,103,620,644	133,500	June 13	865,998,552	157,800	Nov. 21	1,108,125,350
Cleveland Electric Illuminating Company	17	141,850	Dec. 15	564,819,267	155,041	Sept. 9	682,557,097	153,878	Dec. 5	576,131,649	128,319	Nov. 22	543,663,042
West Penn Power Company	18	106,919	Dec. 21	516,829,636	104,618	Nov. 24	524,976,000	94,130	Dec. 22	417,911,000	78,000	Dec. —	404,200,000
North American Company (Missouri System)	19	116,275	Dec. 9	508,893,262	105,749	Dec. 21	471,611,047	99,498	Dec. 3	408,920,575	92,000	Nov. 26	395,820,236
Great Western Power Company	20	95,540	June 7	490,584,257	80,600	July 27	408,577,754	48,000	May 12	213,189,992	45,780	.....	180,040,171
Buffalo General Electric Company	21	115,000	Nov. 14	479,862,700	108,500	Oct. 26	544,293,410	106,500	Nov. 22	508,583,680	104,100	Nov. 22	587,761,870
Pennsylvania Power & Light Company	22	84,203	Sept. 27	442,507,974	87,685	Sept. —	411,639,501	81,435	Nov. —	342,071,900	69,100	Dec. —	310,151,400
Brooklyn Edison Company	23	137,800	Dec. 6	438,887,775	116,500	Nov. 30	382,963,027	105,400	Jan. 15	327,084,075	86,000	Dec. 11	282,424,822
Alabama Power Company	24	115,500	Dec. 20	432,991,540	97,900	Sept. 28	488,089,061	83,100	Jan. 10	347,993,284	86,850	Dec. 19	392,247,862
Pennsylvania Water & Power Company	25	83,000	Nov.	419,987,000	85,000	Very frequent	494,624,400	87,000	Nov. —	512,138,100	89,000	Feb. —	500,641,122
Puget Sound Power & Light Company	26	99,800	Dec. 1	419,197,581	95,725	Dec. 3	472,765,800	93,900	Dec. 18	452,209,000	88,230	Dec. 20	427,800,000
Consolidated Gas, Electric Light & Power Company of Baltimore	27	108,330	Nov. 30	415,335,614	88,990	Nov. 30	429,710,847	80,640	Dec. 5	392,201,280	82,760	Nov. 7	433,196,550
Niagara, Lockport & Ontario Power Company	28	87,000	Nov. 2	415,153,634	88,000	Jan. 6	492,466,460	.....	.....	.....	.....	.....	.....
New England Power Company	29	112,200	Nov. 9	405,979,457	103,450	Jan. 6	430,918,000	93,860	Dec. 9	357,303,224	76,900	Dec. 16	323,127,784
Consumers' Power Company	30	95,410	Dec. 12	397,815,027	106,924	May 19	476,095,098	108,847	Nov. 28	456,230,164	98,666	Nov. 21	404,412,000
San Joaquin Light & Power Corporation	31	61,700	June 27	396,174,690	47,180	Aug 28	299,536,000	.....	.....	.....	.....	.....	.....
North American Company (Wisconsin System)	32	98,887	Nov. 22	375,354,892	90,347	Jan. 6	398,619,744	97,912	Dec. 4	331,874,192	87,855	Nov. 20	327,784,516
Edison Electric Illuminating Co. of Boston	33	128,200	Dec. 15	375,025,955	105,090	Dec. 9	395,076,738	103,136	Dec. 8	328,798,850	95,774	Dec. 6	293,966,604
Washington Water Power Company	34	70,110	Nov. 23	374,378,300	63,955	Jan. 21	351,087,900	63,220	Dec. 3	241,761,350	33,956	Nov. 26	195,628,500
Minneapolis General Electric Company	35	83,590	Dec. 15	373,378,515	78,010	Oct. 26	359,476,651	72,745	Oct. 24	332,264,401	66,189	Nov. 1	297,443,050
Utah Power & Light Company	36	75,661	Jan. 8	362,908,000	85,404	Nov. —	519,854,000	79,780	Jan. 14	461,531,633	81,313	Dec. 27	533,044,137
Tennessee Power Company	37	69,100	May 16	342,948,926	74,800	Apr. 30-June 4	428,649,835	82,300	Feb. 14	422,272,590	87,800	Dec. 11	519,959,383
Los Angeles Bureau of Power & Light	38	51,900	Dec. 21	300,353,806	46,500	Dec. 29	169,489,210	24,650	Apr. 12	134,893,270	.....	.....	.....
Portland Railway Light & Power Company	39	64,800	Dec. 20	298,514,571	62,600	Dec. 6	292,318,971	56,300	Dec. 22	271,600,300	56,900	Dec. 23	258,424,940
Georgia Railway & Power Company	40	72,000	11/3 and 11/28	282,084,977	76,000	Apr. 9	293,721,290	71,700	Dec. 18	262,834,541	68,000	Nov. 8	238,489,012
Union Gas & Electric Company	41	75,000	12/14 and 12/23	281,537,273	65,050	Dec. 21	234,634,375	.....	.....	.....	.....	.....	.....
Michigan Northern Power Company	42	35,018	Aug. 14	258,249,673	35,408	Nov. 12	257,752,195	35,794	Apr. 23	264,272,468	33,519	Dec. 24	233,381,654
Adirondack Power & Light Corporation	43	61,500	Dec. 21	243,370,354	60,700	Dec. 2	277,100,000	66,000	Dec. 23	261,400,000	50,250	11/8-1/23	174,567,275
Narragansett Electric Lighting Company	44	72,000	Nov. 23	243,087,000	54,000	Jan. 5 & Nov. 16	213,232,000	57,000	Dec. 23	155,678,890	45,000	June 20	150,028,780
Potomac Electric Power Company	45	65,000	Dec. 14	238,028,571	62,000	Nov. 30	225,994,701	55,000	Dec. 17	204,008,647	48,000	Dec. 20	173,180,014
Virginia Railway & Power Company	46	47,000	Dec. 14	208,323,000	46,150	Dec. 22	208,517,000	42,800	Dec. 18	181,280,000	35,700	Dec. 18	164,810,750
Kansas City Power & Light Company	47	50,531	Dec. 23	204,752,604	35,500	Dec. 23	175,939,618	.....	.....	.....	.....	.....	.....
Great Northern Power Company	48	44,200	Jan. 5	204,396,860	46,000	Apr. 20	229,146,730	48,000	May 12	213,189,992	45,780	.....	180,040,171
Pennsylvania-Ohio Power & Light Company	49	45,300	Nov. 9	202,670,200	48,900	Nov. 3	255,537,150	.....	.....	.....	.....	.....	.....
Southern Sierra Power Co. & Nevada-California Power Co.	50	45,700	6/6 and 8/8	199,452,965	32,600	July 23	175,104,808	29,200	.....	165,782,785	28,200	Aug. 6	161,347,690
Idaho Power Company	51	35,635	Sept. 1	190,215,255	34,235	July —	184,843,000	27,090	Aug. —	154,754,000	24,350	Sept. —	134,355,000
Northern Ohio Electric Corporation	52	42,000	Oct. 12	187,249,647	44,400	May —	247,109,963	.....	.....	.....	.....	.....	.....
Rochester Gas & Electric Corporation	53	48,734	Dec. 16	185,480,692	49,400	Oct. 29	193,601,590	42,500	Dec. 2	172,892,249	52,300	Nov. 22	196,171,300
Toledo Edison Company	54	46,700	Dec. 13	179,121,428	52,400	Mar. —	207,830,610	48,220	Dec. —	199,771,799	40,305	Dec. 4	161,103,970
Turners Falls Power & Electric Company	55	57,900	May 17	170,826,000	55,500	May 27	212,926,530	.....	.....	.....	.....	.....	.....
Fort Worth Power & Light Co.	56	29,500	Oct. 15	163,286,500	.....	.....	.....	.....	.....	.....	.....	.....	.....
Columbus Railway, Power & Light Company	57	38,440	Dec. 12	160,423,240	.....	.....	*153,626,000	.....	.....	.....	.....	.....	.....
Texas Power & Light Company	58	33,620	Sept. 22	156,851,213	33,620	Oct. 14	159,939,831	29,000	Nov. 7	121,212,000	28,800	Sept. —	118,850,000
Appalachian Power Company	59	35,600	Dec. 19	154,500,000	35,300	Oct. —	148,700,000	.....	.....	.....	.....	.....	.....
Dayton Power & Light Company	60	37,500	Nov. 28	134,588,457	31,500	5/25 and 9/28	129,618,270	.....	.....	.....	.....	.....	.....
California-Oregon Power Company	61	20,270	Mar. 16	133,091,607	20,335	Jan. 28	143,025,818	.....	.....	.....	.....	.....	.....
Northwest Utilities Company	62	31,885	April —	132,788,852	.....	.....	.....	.....	.....	.....	.....	.....	.....
Kansas Gas & Electric Company	63	25,000	Dec. —	130,479,900	.....	.....	.....	.....	.....	.....	.....	.....	.....
Nebraska Power Company	64	28,200	Oct. 28	127,758,800	25,500	Nov. 26	114,200,500	22,600	Dec. 22	97,444,900	19,700	Dec. 18	74,708,000
Scranton Electric Company	65	27,900	Dec. 2	117,579,851	26,580	Jan. 9	116,387,472	.....	.....	.....	.....	.....	.....
Central Illinois Public Service Company	66	26,300	Dec. —	114,587,986	.....	.....	.....	.....	.....	.....	.....	.....	.....

Northwestern Electric Company	67	22,190	Dec. 12	113,913,335	20,600	Dec. 10	112,736,089													
Colorado Power Company	68	25,961	Mar. 9	113,805,044	29,078	Oct. 1	116,748,292													
Indianapolis Light & Heat Company	69	29,358	Nov. 9	108,829,278	27,240	Sept. 15	114,416,094													
Indiana & Michigan Electric Company	70	28,280	Dec. 16	105,593,490	27,130	Nov. 9	103,693,910	23,100	Dec. 23	84,160,770	20,700	Dec. 15	81,625,432							
Empire District Electric Company	71	27,700	Dec. —	104,687,540	36,710	June —	148,740,220	32,030	Oct. —	130,114,100	25,400	Sept. 5	114,446,685							
Connecticut Light & Power Company	72	28,255	Nov. 28	101,129,915	33,392	Oct. 12	145,111,822													
Metropolitan Edison Company	73	27,900	Nov. 30	99,815,200	28,000	Aug. 10	133,994,030													
Hartford Electric Light Company	74	31,700	Nov. 14	97,754,000	32,500	Jan. 9	103,000,000													
Tacoma Department of Light & Water	75	28,400	Dec. 20	95,697,600	22,700	Nov. 10	120,598,174													
New Bedford Gas & Edison Light Company	76	40,300	Dec. 21	89,857,700	33,700	June 17	107,599,392													
ELECTRIC RAILWAYS																				
Interborough Rapid Transit Company	1	242,760	Dec. 30	846,487,668	242,020	Jan. 31	816,603,610	239,940	Dec. 19	810,158,475	204,000	Dec. 30	731,058,963							
Brooklyn Rapid Transit Company	2	116,000	Dec. 22	383,039,325	111,147	Jan. 15	489,748,451	111,000	Dec. 16	406,130,443	109,892	Feb. 21	385,346,075							
Philadelphia Rapid Transit Company	3	105,303	Dec. 22	333,222,786	102,210	Jan. 14	349,027,334	101,120	Dec. 18	349,342,666	94,730	Dec. 27	339,232,739							
Boston Elevated Railway Company	4	75,905	Jan. 18	223,051,330	72,225	Jan. 14	246,312,170	71,763	Mar. 23	240,429,915	67,965	Mar. 23	228,131,265							
Pennsylvania R. R. Co., Long Island Power Plant	5	64,030	Dec. 30	201,922,210	55,200	Jan. 5	199,737,907	53,900	Dec. 19	181,017,940	48,600	Jan. 3	165,377,180							
New York Central Railroad Company	6	50,750	Dec. 23	143,275,239	46,440	Dec. 27	157,132,365	44,100	Dec. 29	140,435,406	38,360	Jan. 22	127,412,457							
Twin City Rapid Transit Company	7	44,599	Feb. 8	145,517,164	42,703	Dec. 21	139,711,248	42,612	Nov. 28	133,676,028	44,966	Feb. 19	131,351,288							
Kansas City Railways Company	8	43,500	Jan. 13	129,804,772	51,740	Jan. 8	189,172,898	49,430	Oct. 27	211,707,571	57,280	Jan. 11	209,378,747							
Western Power Company of Canada	9	27,200	Mar. 1	122,684,803																

Blank indicates that no report covering year was received from company.

panies reported an output of more than 100,000,000 kw.-hr. The total output of these electric light and power companies was 31,663,021,872 kw.-hr., of which 3,225,939,413 was distributed by Canadian companies. In other words, the total output of the electric light and power companies in the United States having an annual output in excess of 100,000,000 kw.-hr. amounted to 28,437,082,459 kw.-hr., which is 65 per cent of the total output of all the electric generating and distributing companies of the country during 1921.

The Commonwealth Edison Company of Chicago leads the country, reporting a total output of 1,928,271,943 kw.-hr. The Niagara Falls Power Company, which took the lead in 1920, is a close second, reporting as its output 1,855,120,000 kw.-hr. The Pacific Gas & Electric Company retains third place and is followed by the New York Edison Company and the United Electric Light & Power Company, these companies submitting a combined report.

The larger electric generating and distributing companies are not confined to any single section of the country but cover a widely scattered area. The Pacific States and the Middle Atlantic States are especially active in the consumption of electrical energy, each of these sections having two companies reporting over a billion kilowatt-hours output. The fifth company serves territory in the North Central section.

PRIVATELY OWNED PLANTS PREDOMINATE

The accompanying tables indicate that with one exception all the companies reporting an output in excess of 100,000,000 kw.-hr. are privately owned. The Los Angeles Bureau of Power and Light is the only municipal generating plant the output of which was in excess of 100,000,000 kw.-hr. The report of the Tacoma Department of Light and Water, the only other municipal generating plant appearing in the tabulation, showed an output of only 95,697,600 kw.-hr. for 1921, although during 1920 it reported an output of 120,598,174 kw.-hr.

It is evident from the data in Table II, on page 830, that the same tendency which was noted in the reports covering the generating and purchasing of the electrical energy of these companies for 1920 again prevailed during 1921. Of the sixty-eight light and power companies operating in the United States only eighteen do not purchase energy, although only four companies purchased more energy than they generated in their own plants. Of the nine electric railway companies only three purchased energy and only one company purchased more energy than it generated. In years past most companies have purchased power from other public utilities only at irregular intervals where there was an abnormal request for energy beyond the rating of their own generating stations. The accompanying tabulation would indicate that such an arrangement is now rather the exception than the rule, and that a majority of the large electric distributing companies are purchasing a high percentage of their total output. Two possible causes for these conditions are applicable. First, many of these companies are able to purchase a large portion of their power from other public utilities cheaper than they can generate it themselves, owing to the facilities for cheap development in the locality, such as water power having been acquired by other generating companies. Second, a comparatively high initial investment in plant and equipment of various kinds is needed to generate the additional power which is purchased. In the first case the arrangement is permanent, while in the second case a lowering in construction and equipment prices as well as a more favorable money market, including a lower rate of interest, will indoubtedly enable a large portion of these companies to construct additional units on their systems and to curtail their purchased power to enough for emergencies only. The latter condition is undoubtedly near to fulfillment and such extensions to generating systems will be undertaken in a large way during the present year.

A few companies were unable to report their output as distributed between that sold for light and power purposes and that sold to electric railways. In most cases the energy sold to electric railways is less than 12 per cent of the total output, but some of the larger companies report a distribution of from 25 to 30 per cent of their total output to electric railways.

Reports from electric railway companies indicate that only nine such companies generated more than 100,000,000 kw.-hr. during 1921.

Table II—1921 Detailed Output and Distribution Data for North American Systems

Section and System	Generated and Purchased Output			Distribution of Energy				
	Kw.-hr. Generated	Kw.-hr. Purchased	Total Output	Light	Power	Light and Power	Railways	Inter-Company Business, Line Loses, Etc.
New England States:								
New England Power Co.	231,376,723	174,602,734	405,979,457	148,469,906	158,391,563	306,861,469	33,277,467	65,840,521
Edison Elec. Ill. Co. of Boston	354,932,800	20,093,155	375,025,955	.....	.....	274,944,372	9,103,284	90,978,299
Narragansett Elec. Lt. Co.	229,667,000	13,420,000	243,087,000	25,700,000	40,800,000	66,500,000	†24,700	176,562,300
Turners Falls Pwr. & Elec. Co.	154,538,000	16,288,000	170,826,000	.....	.....	121,800,000	28,500,000	20,526,000
Connecticut Lt. & Pwr Co.	99,594,964	1,534,951	101,129,915	15,139,409	41,297,671	56,437,080	15,913,645	28,779,190
Hartford Elec. Lt. Co.	87,886,000	9,868,000	97,754,000	26,245,000	56,550,000	82,795,000	None	14,959,000
New Bedford Gas & Edison Light Co.	89,857,700	None	89,857,700	7,158,870	55,571,393	62,730,263	12,172,800	14,954,637
Middle Atlantic States:								
Niagara Falls Power Co.	1,855,120,000	None	1,855,120,000	None	1,762,780,000	1,762,780,000	7,592,000	84,748,000
N. Y. Edison Co. and United Elec. Lt. & Pwr. Co.	1,474,664,253	611,800	1,475,276,053	.....	.....	835,264,723	215,699,939	424,311,391
Philadelphia Elec. Co.	877,047,595	None	877,047,595	184,849,627	306,344,272	491,193,899	265,705,184	120,148,512
Public Service Elec. Co.	805,596,180	15,602,795	821,198,975	175,111,981	255,496,855	430,608,836	211,000,536	179,589,603
Duquesne Light Co.	691,681,650	11,216,335	702,897,985	163,983,494	243,886,732	407,870,226	214,920,589	80,107,170
West Penn Power Co.	516,814,057	15,579	516,829,636	40,360,523	346,401,763	386,762,286	27,884,226	102,183,124
Buffalo General Elec. Co.	57,026,790	422,836,000	479,862,700	94,376,425	243,693,247	338,069,672	70,204,600	71,588,428
Pennsylvania Pwr. & Lt. Co.	358,332,142	84,175,832	442,507,974	42,153,564	299,529,024	341,682,588	.....	100,825,386
Brooklyn Edison Co.	438,163,215	724,560	438,887,775	125,880,614	182,137,015	308,017,629	1,947,630	128,922,516
Niagara, Lockport & Ontario Power Co.	79,301,150	335,852,484	415,153,634	None	39,461,473	39,461,473	73,121,456	302,570,705
Adirondack Pwr. & Lt. Corp.	194,447,916	48,922,438	243,370,354	23,621,665	101,677,731	125,299,396	68,154,364	49,916,594
Penn.-Ohio Pwr. & Lt. Co.	202,670,200	None	202,670,200	31,653,290	104,670,487	136,323,777	35,302,566	31,043,857
Rochester Gas & Elec. Corp.	164,891,101	20,589,591	185,480,692	64,524,025	43,813,637	108,337,662	41,478,129	35,664,901
Scranton Electric Co.	106,273,841	11,306,010	117,579,851	21,490,903	58,869,687	80,360,590	19,899,445	17,319,816
Metropolitan Edison Co.	99,575,600	239,600	99,815,200	22,455,000	35,457,000	57,912,000	23,874,000	18,029,200
South Atlantic States:								
Southern Power Co.	740,000,000	50,000,000	790,000,000	.....	.....	.....	.....	.....
Penn. Water & Pwr. Co.	419,987,000	None	419,987,000	.....	.....	.....	.....	.....
Consolidated Gas, Elec. Lt. & Pwr. Co. of Baltimore	172,371,114	242,964,500	415,335,614	85,655,448	191,965,911	277,621,359	81,449,895	56,264,360
Georgia Ry. & Power Co.	246,441,001	35,643,976	282,084,977	.....	.....	175,904,914	52,104,178	54,075,885
Potomac Electric Power Co.	238,023,683	4,888	238,028,571	67,794,243	43,467,901	107,459,477	88,327,569	38,438,858
Virginia Railway & Power Co.	208,323,000	None	208,323,000	Data not available	Data not available	.....	Data not available	50,256,000
Appalachian Power Co.	151,500,000	3,000,000	154,500,000	5,000,000	121,300,000	126,300,000	None	28,200,000
East North Central States:								
Commonwealth Edison Co.	1,910,895,009	17,376,934	1,928,271,943	476,907,263	453,633,680	930,540,943	712,683,840	285,047,160
Detroit Edison Co.	897,978,800	1,400	897,980,200	199,992,300	407,225,600	607,217,900	109,030,100	181,732,200
Cleveland El. Illuminating Co	564,819,267	None	564,819,267	110,625,959	257,131,569	367,757,528	123,090,070	73,971,669
Consumers Power Co.	385,363,170	12,451,857	397,815,027	69,217,469	158,855,803	228,073,272	66,335,338	103,406,417
Union Gas & Electric Co.	281,537,273	None	281,537,273	53,763,298	113,571,410	167,334,708	.....	114,202,565
Michigan Northern Pwr. Co.	258,249,673	None	258,249,673	None	257,529,473	257,529,473	720,200	258,249,673
Northern Ohio Elec. Corp.	98,408,050	88,841,597	187,249,647	36,896,432	64,791,614	101,688,046	45,162,335	40,399,266
Toledo Edison Co.	179,114,148	7,280	179,121,428	39,947,970	62,465,963	102,413,933	45,150,047	31,557,448
Columbus Ry., Pwr. & Lt. Co.	160,423,240	None	160,423,240	35,856,946	61,374,452	97,231,398	27,624,977	35,566,865
Dayton Power & Light Co.	134,588,457	None	134,588,457	25,914,622	75,333,128	101,247,750	10,945,726	22,394,981
Northwest Utilities Co.	108,030,574	24,758,278	132,788,852	4,207,047	114,440,729	118,647,776	None	14,141,076
Central Ill. Public Service Co.	73,436,655	41,151,331	114,587,986	25,319,705	52,956,347	78,276,052	None	36,311,934
Indianapolis Lt. & Heat Co.	108,829,278	None	108,829,278	14,137,553	68,362,023	82,499,576	342,875	25,986,827
Indiana & Michigan Elec. Co.	105,593,490	None	105,593,490	15,506,528	59,478,915	74,985,443	11,123,657	19,484,390
West North Central States:								
Mississippi River Power Co.	602,580,980	None	602,580,980	461,545,139	80,321,432	541,866,571	None	60,714,409
No. Am. Co. (Mo. System)	192,302,912	316,590,350	508,893,262	.....	.....	252,780,921	185,985,858	70,126,483
No. Am. Co. (Wis. System)	315,629,692	59,725,200	375,354,892	.....	.....	241,086,400	79,526,050	54,742,442
Minneapolis G. E. Co.	373,378,515	None	373,378,515	87,022,320	216,758,966	303,781,286	1,330,652	68,266,577
Kansas City Pwr. & Lt. Co.	196,802,630	7,949,974	204,752,604	.....	.....	.....	.....	44,024,281
Great Northern Power Co.	204,290,060	106,800	204,396,860	43,921,493	108,161,309	152,082,802	18,347,017	33,967,041
Kansas Gas & Electric Co.	110,728,300	19,751,600	130,479,900	22,590,127	72,417,823	95,007,950	None	35,471,950
Nebraska Power Co.	127,758,800	None	127,758,800	37,630,000	55,081,700	92,736,311	None	35,022,480
Empire District Elec. Co.	89,206,990	15,480,550	104,687,540	**64,830,000	23,226,000	88,056,000	None	16,631,540
East South Central States:								
Alabama Power Co.	429,112,940	3,878,600	432,991,540	8,227,766	***362,242,465	370,470,231	.....	62,521,309
Tennessee Power Co.	340,819,926	2,129,000	342,948,926	694,082	303,620,636	304,314,718	None	38,634,208
West South Central States:								
Fort Worth Pwr. & Lt. Co.	163,286,500	None	163,286,500	15,207,001	42,750,270	57,957,271	None	105,329,229
Texas Pwr. & Lt. Co.	55,662,000	101,189,213	156,851,213	23,355,832	63,345,065	86,700,897	None	70,150,316
Mountain States:								
Montana Power Co.	572,277,989	None	572,277,989	24,069,740	350,854,376	374,924,116	‡100,070,699	97,283,174
Utah Pwr. & Lt. Co.	.....	.....	362,908,000	51,345,244	181,849,077	233,194,321	None	129,713,679
Idaho Power Co.	185,409,550	4,805,705	190,215,255	61,861,232	68,013,811	129,875,043	None	60,340,212
Colorado Power Co.	112,749,178	1,055,866	*113,805,044	3,999,312	20,653,693	24,653,005	6,422,400	82,729,639
Pacific States:								
Pacific Gas & Elec. Co.	1,266,179,450	222,909,207	1,489,088,657	143,675,405	496,937,216	640,612,621	240,612,977	607,863,059
Southern Calif. Edison Co.	1,079,144,624	145,573,572	1,224,718,196	134,599,562	504,254,192	638,853,754	271,422,279	314,442,163
Great Western Pwr. Co.	487,688,821	2,895,436	490,584,257	40,104,505	272,638,510	312,743,015	27,317,345	150,523,897
Puget Sound Pwr. & Lt. Co.	351,429,649	67,767,932	419,197,581	.....	.....	326,008,062	33,426,822	59,762,697
San Joaquin Lt. & Pwr. Corp.	395,398,090	776,600	396,174,690	30,560,682	200,567,585	231,128,267	4,389,219	160,657,204
Washington Water Pwr. Co.	374,378,300	None	374,378,300	70,288,672	227,433,923	297,722,595	14,820,528	61,835,177
Los Angeles Bureau of Pwr. & Light	201,585,412	98,768,394	300,353,806	10,697,359	224,656,265	235,353,624	None	65,000,182
Portland Ry. Lt. & Pwr. Co.	297,950,100	564,471	298,514,571	38,116,223	106,831,179	144,947,402	28,070,837	125,496,332
Southern Sierras Pwr. Co. and Nevada-California Pwr. Co	194,043,965	5,409,000	199,452,965	3,428,691	129,766,654	133,195,345	None	66,257,620
California-Oregon Pwr. Co.	129,368,808	3,722,799	133,091,607	9,754,925	27,151,855	136,906,780	None	96,184,827
Northwestern Elec. Co.	110,769,014	3,144,321	113,913,335	14,425,440	71,852,860	86,278,300	None	27,635,035
Tacoma Dept. of Lt. & Water	93,993,430	1,704,170	95,697,600	24,559,417	40,049,608	64,609,025	1,119,100	29,969,475
Canada:								
Montreal Lt., Ht. & Pwr. Consolidated	696,575,624	210,655,949	907,231,573	.....	.....	870,000,000	37,231,573	.....
Shawinigan Water & Pwr. Co.	558,710,340	304,413,900	863,124,240	.....	.....	751,188,640	21,000,000	90,935,600
Ontario Power Co.	825,115,600	None	825,115,600	.....	.....	.....	.....	.....
Toronto Power Co.	630,468,000	None	630,468,000	.....	.....	516,279,650	100,039,900	14,148,450
Western Pwr. Co. of Canada	122,684,800	None	122,684,800	.....	.....	7,516,690	None	115,168,110
Electric Railway Companies:								
Interboro Rapid Transit Co.	846,470,680	16,988	846,487,668	None	200,000	200,000	750,516,229	95,771,439
Bklyn. Rapid Transit Co.	383,009,325	None	383,009,325	None	None	None	383,009,325	None
Phila. Rapid Transit Co.	100,129,193	233,093,593	333,222,786	None	None	None	333,222,786	None
Boston Elevated Ry. Co.	223,061,330	None	223,061,330	None	None	None	223,061,330	None
Pa. R.R. Co., L. I. Pwr. Plant	201,818,905	103,305	201,922,210	4,599,120	None	4,599,120	197,323,090	None
N. Y. Central R.R. Co.	149,275,239	None	149,275,239	.....	.....	.....	.....	.....
Twin City Rapid Transit Co.	145,517,164	None	145,517,164	None	None	None	145,517,164	.....
Kansas City Rys. Co.	129,804,772	None	129,804,772	9,995,442	8,055	10,003,497	11,996,868	107,804,497

*Includes 1,037,946 excess by consumers in parallel
**Includes sales to other companies
***Includes sales to other public utilities
†December only
‡Includes 92,593,440 kw.-hr. sold to electric railways.

Outlook for Wiring Supplies in Spain and South America

Some Export Figures and What They Mean—Present Conditions and the Market for Wire and Cable, Railway-Line Material, Wiring Devices, Meters, Instruments, Lamps and Household Appliances

By PHILIP S. SMITH* and A. H. KELEHER†

THE basis of all foreign trade must be a knowledge of the desires and preferences of the peoples of the distant countries and an understanding of the conditions that exist there. Through the co-operation of a number of men of broad personal contact and experience with those far-off lands that offer to America's electrical industry its most favorable opportunities for export selling this series of articles is being written, in the hope that it may sketch a useful picture of the way that business overseas must be built up. A previous article discussed the market prospects for electrical apparatus in Latin America and Spain. Articles to come will deal with Europe and the Far East and also discuss some of the problems of distribution and personal selling abroad.

IT IS an interesting fact worth some consideration that the electrical goods sent from the United States to Spain, Latin America and other Spanish-reading countries formed one of the few items of our exports of which the value in 1921 was not less than the figure for the year 1920. The total electrical exports for these two years, compared with the fiscal year ended June 30, 1914, the last normal year, show an increase of 240 per cent, the actual figures being $10,194,964 in 1914, $34,456,554 in 1920 and $34,719,906 in 1921. Of these totals the portion applying to supply material, in so far as it is listed separately in government statistics, is given in the accompanying table.

Much of the benefit of a study of these statistics is lost, however, because of the item "All other" in the export figures, under which is hidden a large quantity of our supply material. This figure for 1914 was given as $3,736,630; for 1920 it was $9,476,349, and for 1921 it was $9,523,737. All classes of electrical material undoubtedly shared in these increases, although batteries, lamps, wiring devices and insulated wire and cable enjoyed the greatest percentage of improvement. The totals for 1920 and 1921 are unusual, and it is not expected that they will be approached in 1922. It is safe to assume, however, that the sales will not be below those of 1913, and the present indications are that they may go considerably higher. In either case the percentage that can be supplied by American manufacturers, if they desire the business, is much larger than in that year by reason of the more widespread familiarity in these countries with our products and the better facilities now existing for developing and handling trade.

ELECTRICAL SUPPLY MATERIAL EXPORTED FROM UNITED STATES TO SPAIN AND LATIN AMERICA

	1913–1914	1920	1921
Batteries	$172,971	$2,209,394	$1,381,171
Fans	165,905	590,252	468,003
Heating and cooking devices	*	599,207	721,240
Insulated wire and cable	1,314,314	4,717,822	3,431,621
Wiring devices	188,416	1,530,780	1,064,033
Incandescent lamps—metallic filament	146,450	2,182,747	2,245,452
Meters and instruments	172,862	698,425	777,479
Rheostats and controllers	*	874,102	309,483
Switches and accessories	*	1,145,381	1,106,623
Telephone material	645,595	1,478,178	1,391,389
Totals	$2,806,513	$15,926,288	$12,896,494

* Not listed separately in 1913-1914.

The outlook for the sale of all materials entering into the final distribution of light and power to these distant consumers seems extremely bright. Stocks on hand are in many instances very low, on account of the recent general policy of hand-to-mouth buying, and will have to be replenished. Additional demand is originating from the increasing activity in the construction of offices and homes after several years of almost complete cessation.

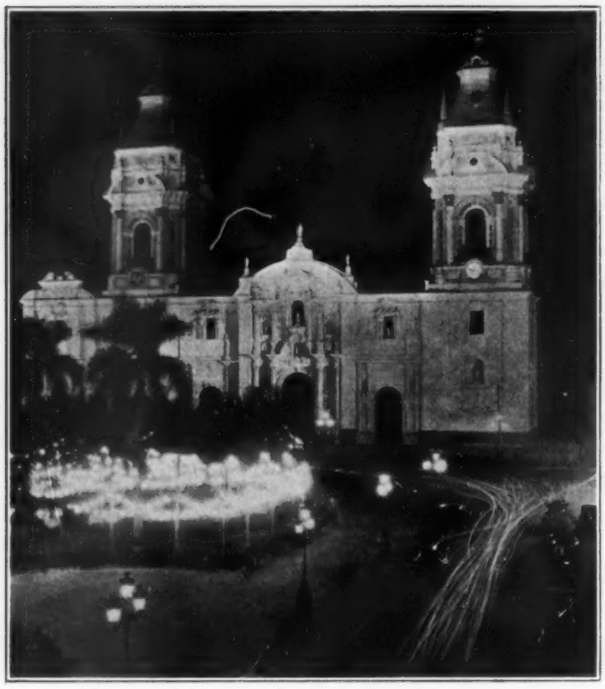
Political conditions are also satisfactory, with little likelihood of any serious disturbances, while the large amounts of loans made to various governments and municipalities during 1921 and 1922 offer good evidence of their basic economic soundness. The recovery of business and purchasing power is dependent more upon the demand for their own products than upon any needed internal readjustment. Industrial revival in the United States and Europe will bring greater exports of raw materials from Latin America, with resultant improvement in exchanges and counter demand for manufactured goods. This upward tendency has been felt already and is now being reflected in various ways in our export trade, and the electrical industry should be one of the first to participate in this permanent revival. A definite program for securing a fair share of this market should therefore be decided upon and put into effect at once.

WIRE AND CABLE

Spain as a purchaser of foreign wire and cable is less important than Latin America for the reason that its own factories supply much of the home demand for everything except a few very special types such as enameled wire for manufacturing purposes. One of the most attractive openings left to American houses is for bare copper trolley and transmission lines and the wire bars for local drawing.

Brazil, Mexico and Cuba are good markets which may be expected to open up again during the coming year. In these and the other South American countries, except Argentina, Uruguay and Chile, the American manufacturer enjoys the advantage of having his regular types recognized as standard by a majority of

*Associate editor *Ingeniería Internacional*.
†President A. H. Keleher Company, New York.



SPECIAL PARK AND FLOODLIGHTING IN LIMA, PERU, AN EXAMPLE OF SOUTH AMERICAN PRACTICE

the large users. In the three countries last named there is competition from European wire with insulation different from that used by us and marked in millimeter sizes. But these are not insuperable obstacles, and with rare exceptions American wire and cable is accepted and employed freely for all purposes.

Sales are facilitated greatly if stocks are carried locally to supply the requirements for immediate shipment. In the small sizes it is highly desirable to furnish the wire in 100-m. lengths and in metric dimensions.

RAILWAY LINE MATERIAL

The line material used by many trolley systems in these countries differs radically from that which is standard in the United States, and this fact sometimes hampers our representatives abroad. The roads do not like to mix several types and will not change from the ones to which they are accustomed except under great provocation. If reproductions can be offered at comparable prices, the way will be much easier. Otherwise it becomes a question of insistence and salesmanship to land an order for our standard goods. Considering the amount of such materials handled each year, however, it is business worth trying hard to get. Transmission lines are being extended continually, creating a demand for all types of pole-line hardware, insulators and even poles themselves. Telegraph and telephone systems form an ever-widening network over all of the countries, and these add to the opening for material of this general character.

WIRING DEVICES AND SUPPLIES

In Argentina the European types of wiring devices have gained a strong foothold, and American types, although selling in fairly large numbers, must be pushed vigorously to succeed. In Brazil, Cuba and Mexico, however, the conditions are much more favorable to standard American types which sell freely, often in preference to European devices.

The situation in Spain is made difficult owing to local manufacturers and the proximity to producing countries. In other days German exporters were in close touch with conditions and by means of rapid deliveries and local stocks were able to dominate the market. But, fortunately for American manufacturers, their products have been the only ones seen on sale for several years, and consequently they have received a splendid introduction to both dealer and consumer. The fact that they are of superior quality has been borne in upon those who have handled them during this period, and they now have a certain clientèle which will continue to buy them, if our efforts are not relaxed, in spite of competition from lower-priced material that is again making its appearance.

METERS AND INSTRUMENTS

There are still a large number of circuits in South American countries wholly or partially operated on the flat-rate plan. Except in the very smallest installations, however, the inclination is to adopt the use of house meters, thus increasing the already large demand created by the continual growth in the number of individual consumers connected to the central-station lines. European types of meters have proved very popular, partly because of their price and partly because they have been made with cyclometer or direct-reading dials. They suffer by comparison in quality with American meters, however, and on this basis, aided by intelligent and persistent distribution effort, the latter are gaining in favor with all the important central-station companies.

Switchboard instruments have a continuous outlet because many panels are made up locally for the power plants in mines, industrial establishments or small towns. They are carried in stock in the more salable ratings by all electrical dealers.

INCANDESCENT LAMPS

European lamps have always enjoyed a reputation throughout Latin America for better quality and longer life than those of American manufacture. Whether this discrimination is deserved or not, it will take the same kind of propaganda to overcome it that has put the European lamp in the front rank of consumer popularity. This consisted of extensive advertising over a period of several years, the manufacture of the popular sizes in round bulbs, with filament arranged to give an especially white light (which is decidedly preferred to the pear-shaped lamps), and the maintenance of large stocks from which the dealer can be supplied on short notice. These and other minor but well-conceived sales helps were very influential in the formation of favorable public opinion. They suggest the way to be followed by others who would introduce new makes in competition with the old, familiar ones.

Competition is going to be felt from domestic as well as from other European lamps, particularly in Spain, where until last year, when Dutch and British lamps again appeared in quantities, importations had dropped to less than 10 per cent of pre-war figures because of increased domestic production. Lamps are being made also in Brazil and Argentina, but the home product has not yet reached proportions that threaten the foreign trade with serious curtailment. This production will not take place in Argentina until a stronger and more experienced organization enters the field, and none is in sight at the present time. In Brazil there

is a small but modern factory, equipped and managed in the American way, which expects to dominate the market when in final running order.

Public lighting in the more progressive centers is undergoing a radical change which will bring it into line with the best practice known in the United States. Arc lamps are being retired from service as they wear out and need repairs or with the deliberate intention of scrapping them to make way for the installation of high-power incandescent lamps. Hand in hand with this movement goes the increased demand for ornamental standards, reflectors and special glassware appropriate for this service.

A large increase in this field can be looked for owing to the increased use of the pleasure automobile, which brings in its wake good roads and boulevards.

Fan Prospects

Electric fans are growing in favor each year, and it is largely inferior merchandising methods that limit the number sold in the large cities. They will become one of the best selling lines if they can be got into the homes and not, as now, confined to offices and business houses.

The temperature in some of the countries under consideration is such that a fan, once acquired, would be used throughout the year, while in every country the summer months would be much more enjoyable with one or more in the house. The old conservatism which has up to now been set against the electric fan is breaking down, and any efforts expended in this direction should in the long run reap a good reward.

Especial attention must be paid to the manufacture of fans, as well as other small apparatus, for operation on 220-volt circuits. They should be of all types, oscillating and stationary, for mounting on walls and desks. Ceiling fans also have a large degree of popularity for offices and restaurants. The finish is important, nickel being preferred to the all black which is so commonly put out.

Heating and Cooking Devices

Few household devices have taken a strong grip upon these markets, and the reasons ascribed is the manner of living to which the people are accustomed. However, flatirons and small stoves are in good demand, and toasters, coffeepots and hot-water heaters show unmistakable signs of growing in use from year to year.

In Argentina, Brazil and Spain there is considerable competition from local manufacturers of heating and cooking devices, whose product, although better than some of European origin, is not so good as the American either in appearance or quality. It finds a market among the middle-class trade on account of the lower prices at which it is sold, but the more well-to-do purchasers prefer the imported devices in appreciation of their superior operating characteristics.

Cooking untensils are not especially popular as yet, but small-space heaters ought to have a good field both in Spain and the southern countries of Latin America, as well as in Mexico and the tropical countries of Peru and Bolivia, for climatic conditions in these countries render some heat in the winter months very desirable.

The market for labor-saving appliances, such as vacuum cleaners, clothes washers, dishwashers and ironing machines, is not at all favorable at present. Because of the cheapness of domestic labor the South American shows but small desire for household equipment of this kind and the Spaniard is little more accustomed to it and the market will develop slowly.

AN ELECTRIC SHOP IN SAO PAULO, TYPICAL OF THE BETTER CLASS OF STORES ON THE SOUTHERN CONTINENT

Flashlamps and Batteries

Flashlamps and dry cells are universally used in both Latin America and Spain. Those made in the United States have been much more successful than any others, with the single exception of one well-known type of European dry cell. This type, which is of undisputed quality, is also relatively high in price and consequently finds its sales confined to a small proportion of the total.

Local competition is present again in the sale of these articles, but the domestic product seen thus far has proved inferior in every way and much is not expected from it under the present conditions of manufacture. It seems possible that improvements will be made in the appliances and that they may at some time really compete for first place in the local markets. Until then American makes will continue in the lead.

The Matter of Design

The question is often asked whether an American manufacturer should make up goods especially for foreign trade without regard to the standards existing in the United States. There are several such articles—notably light-weight iron conduit, wire with special insulation and a cheap type of lamp socket—which now enjoy a large sale in South America because the users want them. Whether or not these lines are to be made in the United States would seem to depend upon whether they can be produced at a cost as low as the cost in other countries. If not, then there is no advantage to be gained from their manufacture, since the product would have no particular merit to justify a higher selling price, whereas with the standard design the better quality can be urged in support of the higher price. Each manufacturer must decide for himself on this basis how far he wishes to go in the direction of special export design where it is a factor in this market.

Letters from Our Readers

This is a readers' forum. Comments on questions before the electrical industry presenting economic, financial, engineering or commercial aspects and new or supplementary viewpoints on published articles are cordially invited

Voltage Regulation of Long Lines

To the Editors of the ELECTRICAL WORLD:

In Frank G. Baum's article in the August, 1921, *Journal of the American Institute of Electrical Engineers* on the subject of "Voltage Regulation and Insulation for Large-Power Long-Distance Transmission Systems" the claim of novelty is advanced. The writer believes that a reference to his paper in the ELECTRICAL WORLD for Aug. 10, 1912 (Vol. 60, pages 311-313), entitled "The Propagation of Electric Energy by Standing and Traveling Waves," will show that in several points his work anticipates that of Mr. Baum. In particular, the writer's Fig. 8 and the formula near the end of page 313 should be compared with Mr. Baum's Fig. 5 and the tabulated data of line constants.

It is not claimed that the system of power transmission proposed by Mr. Baum is the same as that proposed by the writer. It is claimed, however, that the prior article shows the equation between loading, current and voltage which gives a traveling wave, and that a traveling wave results in substantially constant voltage the whole length of the line.

Mr. Baum advances the claim that the natural periodicity of the line may be neglected. This may be conceded so long as the synchronous regulators remain on the line. However, if these regulators hunt, or if the breakers connecting them to the line open, and the line is not sectionalized, then there would be a resonant condition that would be dangerous. The line discussed in Mr. Baum's paper is only 50 miles longer than a "quarter-wave line," and Dr. Steinmetz proves in his "Transient Electric Phenomena," pages 306-319, that such a line regulates for a constant current at its distant end. Therefore, at light loads, either the synchronous regulators must be kept on the line or the line must be sectionalized, otherwise the far end of the line will be subjected to excessive voltage stress.

These abnormal voltages are due to the reflection of the outgoing electric waves at the far end of the line, which form standing waves, in combination with the outgoing waves. There are in reality only two remedies: (1) Load the line at all times in such a manner that the characteristic impedance of the line is equal to its terminal impedance; (2) load the line in such a manner that the surge is harmless—*i.e.*, make it a half-wave line. The first is Mr. Baum's proposal, the second was that of the writer.

The cost of synchronous-regulator loading (for traveling-wave propagation) increases with the length of the line and with the voltage. The cost of half-wave loading should decrease with these factors, being zero for a 1,500-mile line at 60 cycles. For 220,000 volts and 800 miles the writer believes that Mr. Baum's proposal is the cheaper, with a rather close margin.

Since the issue of safety has been raised, it should be stated that the writer has no doubt that proper precautions will solve the difficulty. The natural attenuation in 1,600 miles of line will help, corona will help, and sectionalizing should remove the danger. There is no positive reason why synchronous regulators should not run stably on the line except a possible defect in synchronizing power.

The following curious application of the theory of wave propagation may or may not have a bearing upon the question:

The velocity of propagation of a wave is given by the following formula, where L and C are the line constants including loading: $V = 1/\sqrt{(LC)}$. When the line is unloaded the velocity is aproximately 180,000 miles per second. When series inductive and parallel capacity loading is used the velocity is less than the above. However, with parallel synchronous regulator loading, operating inductively, as in Mr. Baum's proposal on light loads, the velocity appears to be greater than that of light itself.

JOHN F. H. DOUGLAS.
Marquette University,
Milwaukee, Wis.

Grounding Chains Burned at Links, but Carried Short-Circuit Current

To the Editors of the ELECTRICAL WORLD:

I have read with great interest the article by Alfred Herz on grounding chains appearing on page 177 of the ELECTRICAL WORLD for Jan. 28, and also your editorial comment in the same issue on page 169. Possibly some of the experiences which I had with grounding chains while attached to the Royal Engineers in France during the world war may be of interest to the readers of your paper.

On one occasion a mistake was made as to the particular section of line which should be "killed," and a grounding chain was thrown over a live 13,500-volt, three-phase line, the bottom end of the chain being well earthed before throwing. The chain, which was made of brass, stood up well under the short circuit, showing signs of burning only at a few links. The fuses in the nearest substation "blew" almost immediately. The man who threw the chain was badly scared but not killed.

On another occasion some line work had just been completed alongside the main substation, in which I was doing some work. I asked the line gang to leave the grounding chain on the line, saying that I would clear it when finished. This I forgot to do, and closed the main oil switch feeding the shorted and earthed line. One set of high-tension feeder fuses blew, and the main oil switch opened. I reached the outside of the substation in time to see a shower of sparks from the grounding chain, which this time was badly burned at several links and almost fused through where it crossed the live wires.

The chain was known as "heavy brass plumbers' chain" and had links ¾ in. long of about No. 16 gage brass. It is flexible, portable and easily thrown, and in the instances mentioned it certainly had enough current-carrying capacity to clear the line at any rate.

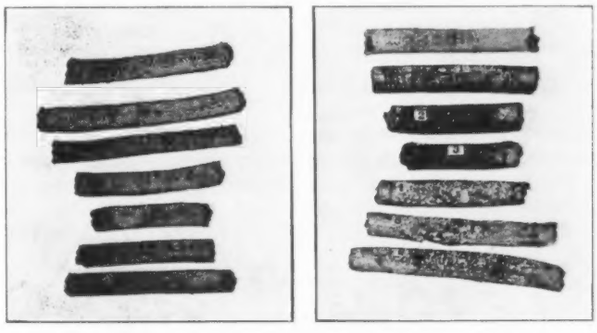
NELSON JONES,
Assistant General Manager.
National Electrical & Engineering Company, Ltd.,
Wellington, N. Z.

Industrial and Station Practice

Installation, Operation and Maintenance of
Generating and Distribution Equipment and Economical Utilization of Electrical Energy
in Mills and Factories, Including Testing and Repair Methods

Station Wiring Adequately Protected by Fireproofing Liquid

THE successful fireproofing of substation wiring by applying a liquid to the insulation was recently demonstrated in a series of tests made by the Puget Sound Power & Light Company on a number of samples of cables. The results were very satisfactory and prove that the expensive method of applying asbestos covering to wiring for protection against fires can in most cases be dispensed with.



ADEQUATE PROTECTION AFFORDED STATION WIRING BY FIREPROOFING LIQUID

Left—Specimens before tests. Right—Appearance of cables after tests made with arc and flaming transformer oil.

The principal objects of the tests were (a) to determine if the ordinary flame-proof braiding on cables would prevent the destruction of insulation when subjected to an electric arc, (b) to determine the effect of an arc on oil-saturated untreated flame-proof braiding over varnished-cambric insulation, (c) to determine the degree of protection against fire from flaming oil that would be obtained by applying fireproofing solutions now on the market to flame-proof braiding.

The tests were made on specimens of large cables having $\frac{5}{32}$-in. and $\frac{11}{32}$-in. varnished-cambric insulation and two layers of white flame-proof braid. To each of the treated samples before being tested were given two coats of fireproofing fluid and one coat of finishing fluid. Arcs were established with the conductor through holes bored in the insulation.

In the case of the untreated samples each time the arc was established the flame-proof braid and insulation near the hole would burn slowly for periods varying from one to two minutes, but it was not possible to establish an arc that would consume the insulation. Cold transformer oil was then poured over the entire surface of the specimen and the arc re-established. It immediately burst into flame and the fire consumed the entire insulation.

When an arc was established in the hole of a treated sample practically no carborization took place. The specimen was then saturated with oil. When the arc was established the insulation around the hole burned less than two minutes, after which time the flame extinguished itself, with very little resulting damage to the insulation.

A specimen of untreated cable was mounted on supports several inches above the floor, and transformer oil was heated in a babbitt ladle until it flamed, and then poured over it. The entire specimen was immediately enveloped in flame and continued to burn at a rapid rate until it was seen that the insulation would be completely destroyed. A treated specimen was then tested in a similar manner, and even on three applications of the flaming oil no combustion of the insulation took place. A gasoline blowtorch was then applied to the oil remaining on the cable near each end, but no combustion took place. The braid was scarcely injured at all.

The tests showed conclusively that station wiring having two flame-proof braids can be effectively fireproofed against flaming oil by the application of fireproofing fluids. They also show that it is not necessary to resort to the expensive methods of wrapping asbestos tape over the braids and applying the fireproofing fluids to the tape.

There are, however, some situations where the asbestos tape is highly essential, and when these are encountered it should be used.

S. C. LINDSAY,
Electrical Engineer.
Puget Sound Power & Light Company,
Seattle, Wash.

Characteristics of Rural Load Fed by 6,600-Volt Line

OPERATING conditions on an Iowa farm line were studied in the early part of 1921 by the engineering extension department of the Iowa State College at Ames to note the variation of load, voltage and power factor over a twenty-four-hour period.

The testing equipment was placed at Adel, Iowa, on a 6,600-volt, 60-cycle line of the Adel Light & Power Company. The line is 22 miles long, including branches. No. 6 hard-drawn copper is used throughout. Thirty-nine farm installations are connected, including the county farm, besides the town of Minburn, farthest away, with a population of about 450. Readings were taken from Jan. 1 to April 21, with some short interruptions. There are in all thirty-two transformers connected, representing a connected capacity of 165½ kva. Fifteen of these are of 5-kva. capacity, besides two of 15 kva. and one of 25 kva. which serves Minburn. Motors connected represent approximately 50 hp. or 60 hp., with about 20 hp. used for grinding and sawing purposes.

A continuous fluctuation of almost 1 amp. and lasting from fifteen minutes to one hour shows at several places on the ammeter chart. This was caused by a 15-hp.

motor at the county farm used for sawing wood. It may be of interest to know that the ratio of the current transformer was one to one, so that there was the same fluctuation on the 6,600-volt side. According to figures obtained from the company, there were 3,684 kw.-hr. consumed monthly at Minburn during the test. This, estimating thirty days a month, represents a constant load of 5.116 kw. With 25-kva. transformer capacity connected the capacity load factor is 20 per cent. With the above consumption representing roughly 60 per cent of the total, a 20-kva. transformer would safely take care of the load.

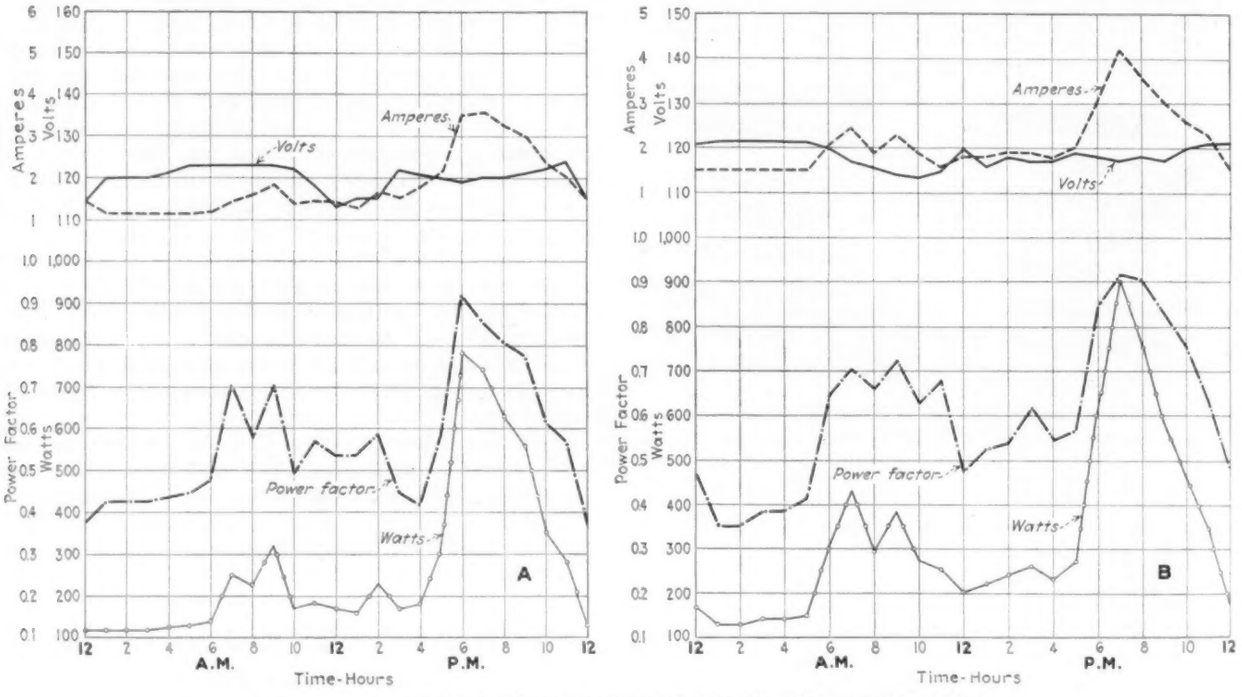
The average current during the test was 2.3 amp. and the average voltage was 116.8 volts, while the average power factor was 0.583. The transformer core loss and line loss represented a total monthly loss of approximately 1,504 kw. With the watt-hour meter indicating a monthly consumption of 6,320 kw.-hr., this is a loss of 23.8 per cent. The load factor for the line is 39 per cent, taking the maximum power for fifteen minutes each day during the peak load.

The variation in power factor follows very closely the variation in load. In the early hours of the morning, when the load is practically all losses, the power factor drops to 0.3 in some cases. As additional load comes on in the morning the power factor rises and varies with the load, falling off again during the noon hour. One interesting fact which, of course, will be more striking in the winter time is that a dark, cloudy day can be readily distinguished, especially in the morning, for the power factor will be much higher owing to the lighting load. The peak load will, of course, come on earlier in the morning and be greater on a cloudy day.

These data were submitted at a meeting last summer of the Iowa Section of the National Electric Light Association.

FIELD EDITOR ELECTRICAL WORLD.

Chicago, Ill.



CURVES SHOWING LOAD CONDITIONS ON RURAL DISTRIBUTION SYSTEM IN IOWA
A—Typical Saturday load. The Sunday load is very similar to this. B—Typical weekday load.

Old Defective Tie Switch Gives Peculiar Trouble on 66,000-Volt Line

WHEN testing out a 66,000-volt line after a very severe storm last summer an unusual trouble was encountered. Although it was thought that all defective insulators had been replaced, a surging current resulted when voltage was built up on the line.

The system at the time of the trouble consisted of two 66,000-volt, three-phase lines, approximately 40 miles long, both circuits being on the same tower. The lines were connected delta-delta throughout and ungrounded. At the far end of the system there was a set of disconnecting switches which allowed tying both lines together. These disconnecting switches are of the strain type, supported entirely by suspension insulators; one vertical string of insulators supports each end of a switch, and a horizontal string in the line of pull holds the hinge end of the switch at the proper distance from the jaw end. This last string of insulators is parallel with the switch blade when in the closed position. The disconnecting switches are usually open and were open at the time that the trouble occurred on the system.

During a severe electrical storm one of these lines developed considerable insulator trouble, and after the storm it was repaired. The usual method of testing a line after a repair is to connect a generator and transformer to the line without voltage on the generator and then gradually building the voltage up to about 110 per cent of normal. In case the line still shows bad performance, this does not cause a disturbance on the rest of the system.

This method was followed in the case in question. On raising the voltage of the generator it was noticed that the ammeters on the transformer and generator were swaying badly. This applied to only one phase. As the voltage was not above 20 per cent of normal

and the ammeter on only one phase showed a reading, it was realized that the trouble was not a short circuit. The voltage was reduced to zero and built up to 20 per cent of normal with the same result every time it was done.

At this time a message came in over the telephone from the substation operator at the end of the line, stating that the trouble was caused by the breaking down electrically of one string of insulators across the open tie switch in his yard, allowing the live 66,000-volt line to feed through this string of insulators back to the line under test. The attention of the operator was called to the trouble by the flashing of the arc through the insulator. As the generator would swing into phase with the rest of the system, this phase of the winding would tend to oppose the line voltage. As it swung 180 deg. out of phase the current would read its maximum, owing to the capacity effect of the generator and transformer windings and line wires and to the leakage loss over the insulators of the other phase wire. After this trouble was discovered the insulators on the disconnecting switch were replaced and the line was tested "O.K." at 10 per cent overvoltage.

If this line had been thrown on the system, there would have been no indication of trouble on this string of insulators as the voltage on each side of the insulators would have been the same. L. A. FITTS.

Turners Falls, Mass.

Peculiar Behavior of Rotary Converters

THE suggestions by T. F. Barton published on page 385 of the Feb. 25 issue of the ELECTRICAL WORLD as to the causes of the rotary-converter trouble, described in my recent article (page 289 of the Feb. 11 issue) are very much to the point. However, the following are the facts in the present case:

The brushes used on these machines were "prescribed" by a brush engineer about nine years ago and were very satisfactory, never giving trouble, until about three years ago, as described in my article of Feb. 11. The commutation on these machines is so nearly perfect that no sandpaper, oil or lubricant of any kind is ever used, and there is a total absence of sparking at all loads. Neither is there any oil on the commutator or brushes from any source. The slots are standard width, about 0.028 in. to 0.030 in.

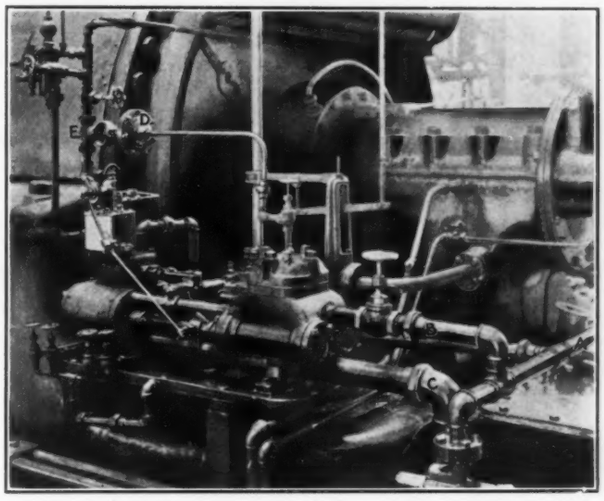
The most puzzling fact is that the machines will operate indefinitely at full load, or the direct-current load can be taken off and the machines run idle, faultlessly in either case, as long as they are kept rotating by the supply of alternating-current energy. But if alternating-current energy is interrupted and the machine is allowed to slow down even enough to let the direct-current voltage drop to zero, and then is again brought up to speed, it will develop "shorts" in the commutator slots. In most cases this occurs after machines have been standing still for from five minutes to two hours, but in some cases it happens before rotation has stopped.

A rotary-converter expert sent by the makers of the machines, after seeing their action, admitted that he had never seen or heard of anything like it and could give no explanation whatever of the cause of the trouble, and the only remedy suggested was to chamfer off the edges of the bars—what Mr. Barton terms "V-ing." This, coupled with great care in starting, has enabled us to avoid hot coils, but we are still unable to determine the real cause of the trouble. E. C. CHANNING.

Niagara Falls, N. Y.

Automatic Lubricating Auxiliary Pump for Safe Turbine Operation

THE insurance of constant lubrication for high-speed turbine bearings is of the utmost importance as the turbine will not operate for more than a minute without pressure lubrication. In modern turbines an auxiliary oil pump is included as standard equipment, but in some types of turbines proper lubrication depends entirely upon one rotary-pressure pump. In order to increase the factor of safety of two 1,500-kw. turbines made by the General Electric Company, the Galveston & Houston Electric Railway Company at its Webster power station so connected the auxiliary pumps which are mounted on



AUXILIARY PRESSURE PUMP AFFORDS ADEQUATE PROTECTION TO TURBINE BEARING

the frame of each turbine convenient to the discharge gear pump as constantly to have the main pump pressure on the oil cylinder of the auxiliary.

The piping for this layout is shown in the accompanying illustration in which *A* is the discharge of the main pump, *B* the discharge of the auxiliary, *C* the auxiliary intake and *D* the diaphragm governor. Under normal operation the pressure on the diaphragm governor is the same as at *A*, and the spring of *D* is set at a pressure slightly less than that of the oil. In case of failure of the gear pump, the pressure on the diaphragm cylinder falls off and allows the spring to operate the steam-inlet valve *E*, and start this auxiliary pump, which maintains the pressure on the bearings.

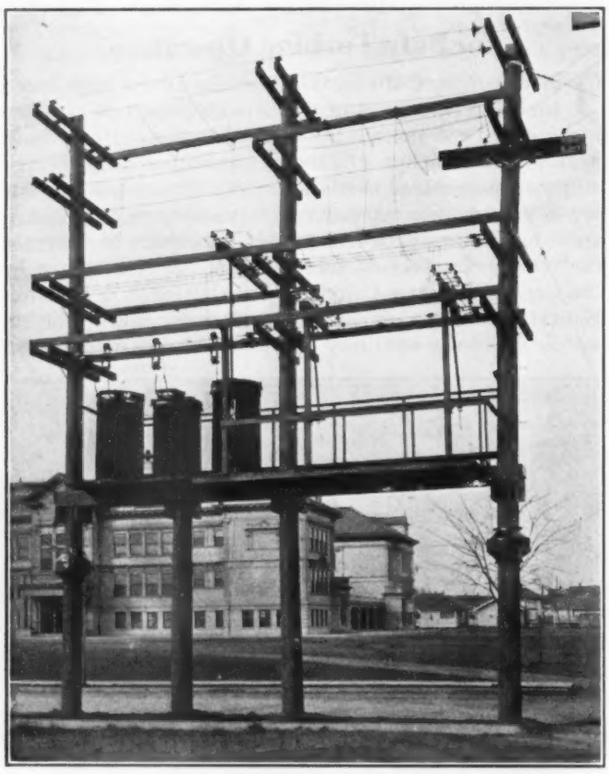
The diaphragm governor is usually set so as to keep the steam entirely cut off at normal operation, though it is good practice to have the steam valve slightly open and keep the auxiliary moving just fast enough to keep the cylinder hot and get rid of the condensate.

This method of putting an auxiliary oil pump into service is not necessarily restricted to turbine lubrication but may be used wherever pressure lubrication is employed. J. F. USENER.

Galveston & Houston Electric Railway Company,
Houston, Tex.

Pole Guards Bar Mischievous Boys

IN ORDER to prevent the inquisitive small boy from climbing the poles which support the transformers and other apparatus of the outdoor substations of the Northwestern Electric Company, an unusual device



SMALL BOYS FIND IT IMPOSSIBLE TO CLIMB PAST THE GUARDS ON POLES

called a safety door has been evolved and has proved effective. The doors are built of sheet iron with a swinging door which may be locked shut or opened to permit a lineman to ascend the pole.

Northwestern Electric Company, Portland, Ore. — E. F. PEARSON, Engineer.

Cost of 1921 Extension $100 per Kva.

COST data available upon a 12,500-kva. addition to a steam-driven central station in eastern New England are given below, the total outlay being approximately $1,251,000, excluding land. Two 755-hp. water-tube boilers, piping, condensing equipment, building extensions, steel stack and electrical apparatus necessary to the above increase in plant capacity are included. Cents are omitted.

Engineering cost	$43,423
Services of construction engineers	91,926
Office at works, etc.	15,192
Insurance	9,113
Temporary construction	27,427
Shrinkage in construction equipment	1,267
Station yard	15,757
Building	226,794
Equipment foundations	18,505
Boiler plant	76,457
Draft system	30,157
Condenser system	125,762
Piping and covering	56,431
Coal and ash-handling installation	85,159
Turbo-generator equipment	215,649
Station transformers	20,502
Switchboard and wiring	97,531
Auxiliary equipment	24,999
Machine shop	1,256
Machine-shop equipment	8,596
Testing and preliminary operation	7,362
Local expenditures on job	15,239
Interest during construction	36,774
Total	$1,251,288
Cost per kva.	100

Boston, Mass. FIELD EDITOR ELECTRICAL WORLD.

Water-Tube Type of Arrester Compares Favorably with Others

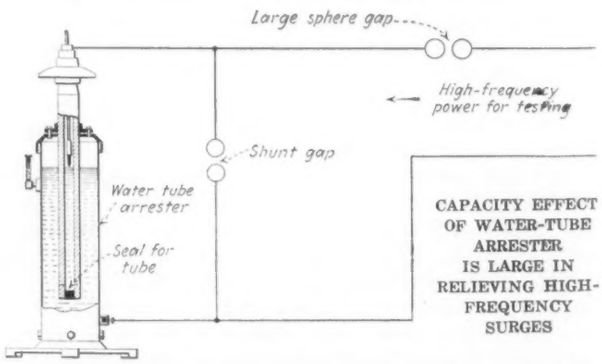
THE water-tube type of lightning arrester compares most favorably with other standard types of protective devices for relieving high-frequency discharges on transmission lines. The results of tests made under the personal supervision of the writer also indicate that with this type of arrester the capacity effect in relieving high-frequency surges is greater than anticipated.

The object of these tests was to determine as accurately as possible with the available equipment the comparative impedance to high-frequency and high-voltage surges which is imposed in the discharge circuit by the standard makes of lightning arresters. Three different types of arresters were tested, two of the electrical valve type and one of the water-tube type. The testing equipment provided a potential estimated at 350,000 volts at a frequency of about 270,000 cycles per second.

Each arrester was in turn connected in series with a large sphere, as shown in the accompanying illustration. The voltage was then brought up to such a value that 0.5 amp. would flow through the arrester. In order to measure the voltage drop across the arrester under this condition another gap of 3-in. spheres was shunted across it. This gap was adjusted until it would just arc over when 0.5 amp. was flowing through the arrester, and the length of the gap under this condition indicated what the voltage was across it. The equivalent setting of this gap for each arrester was:

A. Valve type, oxide film, 0.44 in.
B. Valve type, aluminum cell, 0.25 in.
C. Water-tube type, 0.25 in.

A further test was then made to determine the amount of condenser effect secured by the water-tube arrester. The lower end of the porcelain tube was completely sealed so that no current could pass directly through the apparatus. The tube and tank were then filled with water to the usual levels, as shown in the illustration, and with 34 in. of tube submerged. The tests were then repeated. The shunt gap in this case was 0.44 in., indicating a capacity effect in relieving high-frequency surges that was greater than expected.



CAPACITY EFFECT OF WATER-TUBE ARRESTER IS LARGE IN RELIEVING HIGH-FREQUENCY SURGES

Alabama Power Co., Birmingham, Ala. — GEORGE H. MIDDLEMISS, Superintendent of Distribution.

Management and Policy

Embracing Central Station Commercial Organization and Management, Customer and Trade Relationships, Public and Financial Policies, Advertising, Selling and Service Methods

Some Significant Attendance Data on Cleveland's Electrical Homes

Detailed Figures Covering the Number of Daily Visitors at Three Different Homes Indicate the Keen Public Interest in This Countrywide Movement

CONCLUSIVE proof of the far-reaching educational value of electrical homes and the ready sale of the houses used for the demonstrations are seen in the statistics covering the three homes opened in Cleveland during 1921.

The first house, which was valued at $37,000, was open from May 15 to June 15 and was visited by 34,354 persons, an average of 1,673 per day. It was sold in the last week of the exhibition. The second house was valued at $48,000 and was in a more exclusive neighborhood. Between Sept. 11 and Oct. 9 it received 34,790 visitors, or 1,199 per day on an average, and the home was sold in the second week. The third home, in a more modest residential section of the city, was valued at $17,000, and from Oct. 16 to Nov. 13 was shown to 13,965 persons—a daily average of 481. This home was also sold in the second week. The accompanying record gives some interesting insight into the way in which this attendance was distributed according to the day and the weather.

CLEVELAND ELECTRICAL HOME VISITORS

No. of Days	Day	First Home Open 32 Days, May 15-June 15	Second Home Open 29 Days, Sept. 11-Oct. 9	Third Home Open 29 Days, Oct. 16-Nov. 13
1	Sun.	3,004	2,755	1,648
2	Mon.	752	1,387	502
3	Tues.	786	1,390	451
4	Wed.	749	1,365	360 R
5	Thurs.	1,139	1,246	253 R
6	Fri.	860	1,258	376 R
7	Sat.	509	687 R*	383
8	Sun.	1,805	2,666	1,691
9	Mon.	520	942	437
10	Tues.	698	926	475
11	Wed.	704	825	422
12	Thurs.	698	1,190	315 R
13	Fri.	482 R	1,160	380
14	Sat.	275 R	678	555
15	Sun.	2,179	2,621	1,537
16	Mon.	1,276	798 R	251
17	Tues.	414	1,045	15 R
18	Wed.	620	1,054	321
19	Thurs.	770	1,126	225
20	Fri.	591	660	264
21	Sat.	649	848	190
22	Sun.	2,902	2,116	726
23	Mon.	728	543	249
24	Tues.	868	468	359
25	Wed.	814	932	78 R
26	Thurs.	903	1,247	346
27	Fri.	703 R	186 R	341
28	Sat.	492	390 R	245 R
29	Sun.	3,300	2,281	570 R
30	Mon.	1,215	.....	.....
31	Tues.	1,656	.....	.....
32	Wed.	1,442	.....	.....
	Total.....	34,354	34,790	13,965
	Average per day	1,073	1,199	481

* Rain. (Total for three homes, 83,109)

These guests were all invited to fill out a registration card and an appliance was awarded as a prize each night to the visitor whose card was drawn. At the second home 29,256 out of 34,790 guests signed cards and interesting data were obtained. After throwing out duplicate cards, cards from non-residents and those lacking in information, there remained 13,550 cards, representing the same number of different addresses and families. These cards gave the following facts:

		Per Cent
Number who own home in which they live	6,775	50
Number who plan to build	4,485	33
Average number of convenience outlets per home	3½	...
Appliances owned:		
Ranges	367	2.7
Dishwashers	180	1.3
Electric refrigerators	129	0.9
Clothes washers	4,908	36
Sewing machines	2,120	15
Vacuum cleaners	9,703	71

The character of the attendance in itself was interesting. To the second home alone visitors came from 1,243 streets in Cleveland, from 133 other cities in Ohio and from 146 cities in twenty-five other states and foreign countries. Pennsylvania sent the largest number of the latter, registering 105 guests, but there were six from California, seven from Florida, one from New Zealand and one from the Argentine.

Central Maine Company's "Ten Points" for Employee Stock Salesmen

CENTRAL-STATION employees sometimes feel that they, individually, are not qualified to sell stock in a customer-ownership campaign. They think they lack the necessary sales experience or have not sufficient knowledge of the company's affairs or the value of the securities. To meet this situation the Central Maine Power Company has used successfully what it calls the "ten-point" plan. The employees who are not regular salesmen are asked to call on ten prospects and tell each one these ten points:

1. Our company is offering for sale a 7 per cent preferred stock. That is, this stock pays $7 a year a share, or $6.50 a year on each $100 you invest. It pays its dividends quarterly.

2. The company is offering this preferred stock to its customers in the first place because it has use for investment money, and because it believes in customer-ownership.

3. I believe this stock is safe and that it will always pay dividends. I believe this for a good many reasons. First, it is a legal investment for Maine savings banks, and is owned by three and by quite a number of banks and trust companies. Secondly, because the company is growing steadily and its earnings are increasing. Third, because the company owns property that would cost, it is estimated, considerably over $25,000,000 to replace. Fourth, the company is under the jurisdiction of the Public Utility Commission of the State of Maine. Fifth, the company has paid dividends on its preferred stock for over eighteen years—sixty dividends without interruption. Sixth, the company is managed and owned by Maine people. Seventh, the company has 41,000 customers, and takes in over $3,000,000 a year in gross earnings.

4. If you put your money in this stock, it is not only safely invested, but it is set to work developing Maine. It is largely used to develop and distribute power. This development of power tends to bring factories to Maine, and this helps us to get lower taxes and greater prosperity.

5. All of the money you put into this stock stays right here in the State of Maine.

6. Every cent of its goes directly or indirectly into property; dams, power houses, and pole lines, all right here in the State of Maine.

7. The stock is exempt in Maine from all state, county, city and town taxation. It is exempt from the federal income tax up to the surtax.

8. This stock is no trouble at all to the man who owns it. He gets a dividend check four times a year. The rest of the year he doesn't even have to think about it. If you own our stock you don't have to put your certificate in the safe deposit box. If it burns up you go right on getting the dividends. By going through certain formalities, you can get a new certificate.

9. If you need to get your money out of this stock the company will help you.

10. Stock bought now should steadily go up in value. If your prospect is a person who might want to buy on easy terms, tell him: You can buy on divided payments if you wish, $10 down and $10 per month per share. If you own stock yourself, or if you are buying it, say: I am one of over 220 employees of the company who now own this stock or are buying it. We all believe in the stock and the company.

High Rates Caused by Hostile Valuation of Utilities

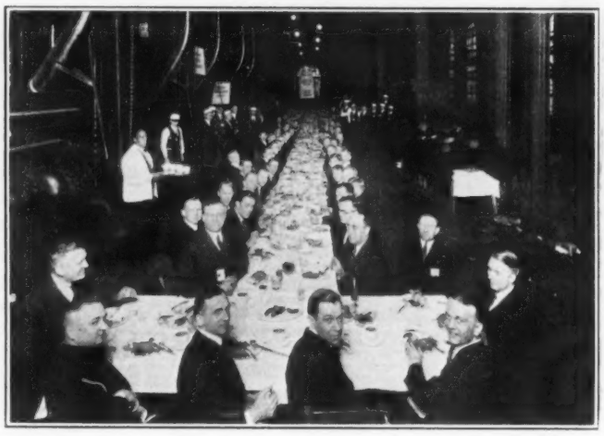
SQUEEZING the physical value of electric light and power companies down to the lowest possible terms fosters high rates and poor service, declared John W. Shartel, vice-president and general manager of the Oklahoma Railway Company, before a recent convention of the Southwest Political Science Association at the University of Oklahoma. Valuation of public utilities in a spirit of hostility is injurious to the communities, and for rate-making purposes it should be carried on in a safe, sympathetic manner such as would induce others to invest money in these enterprises. Mr. Shartel said:

"There are hundreds of plants where the addition of 25 per cent to the capital invested would double the revenues of the institution and cut its operating expenses in two. In fact, this is the rule today and not the exception. There are plants, doubtless, where the value has been depressed by the utilities commission to the least possible point and then confined to a money-lending rate of income on that valuation. The community served by that utility is doomed to exorbitant rates, poor service and a denial of the full benefit it should derive on account of a prohibitory cost.

"On the contrary, a liberal valuation and a liberal income, which measurably fulfills the expectation of the founders of the enterprise, at the outset will insure the expenditure of sufficient capital to attain the highest efficiency, the latest and best apparatus in line with the march of improvements, furnish better service at half the price and still pay a good rate of income to the investor. The ability of an electric light and power company to put electricity on its switchboard at a cost of 1 cent or 3 cents per kilowatt-hour speaks to its consumers in the language of ten-dollar bills. Whether it shall earn 8 per cent or 10 per cent on a narrow value of $800,000 or a liberal value of $1,000,000 speaks to the consumer in the language of dimes. That example discloses the real perspective of the whole utility situation."

Louisville Gas & Electric Entertains Local Electric Club

THIS picture shows one of the "get-together" meetings of the electrical men in Louisville Ky., when members of the Electric Club were luncheon guests of the Louisville Gas & Electric Company at the company's Waterside station. About 150 members of the club attended the luncheon, after which an inspection



LOUISVILLE ELECTRIC CLUB'S LUNCHEON IN WATERSIDE BOILER ROOM

trip through the plant was made. George M. Miller, superintendent of electric distribution of the Louisville Gas & Electric Company, is president of the Electric Club.

What Other Companies Are Doing

Newark, N. J.—The first of a series of special stockholders' meetings was held here recently by the Public Service Corporation of New Jersey. Thomas N. McCarter, president, stated that this would be the first of about fifteen meetings to be held in various cities of the state to acquaint the customer-shareholders with the importance and stability of their property.

Worcester, Mass.—To encourage employee partnership in the company, men and women employees of the New England Power Company have had opportunities to purchase stock in this utility during the last five years. Eight hundred and sixteen subscribers have taken stock of $323,000 par value on the deferred-payment plan.

Portland, Maine.—Thirty washing machines were sold recently in eight weeks by the Cumberland County Power & Light Company, chiefly through newspaper publicity, notwithstanding a reduction of about 50 per cent in display area at the local traction waiting room. R. E. Holden is manager of the appliance department.

St. Paul, Minn.—The Nostpoco Club, an employees' organization of the St. Paul Division, Northern States Power Company, will include in each monthly program a short talk under the general subject "Know Your Own Company." The first talk in the series was given by Garrett O. House, manager of the division, at the last meeting of the club. At future meetings the different department heads will give fifteen-minute talks on the organization and functions of their respective departments.

Manufacturing and Distributing

Devoted to the Discussion of Production, Distribution and Market Development, the Business and Economic Problems of the Manufacturer, Jobber, Agent, Contractor and Dealer

The Need for Organization in the Radio Business

BY CHRISTIAN J. LITSCHER
President C. J. Litscher Electric Company, Grand Rapids, Mich.

RADIO sales have developed with such speed that the distribution machinery has had to be thrown together pretty much on a basis of catch as catch can. It is very much in the mind of dealers, jobbers and manufacturers, therefore, to find the way to guide this business into clear channels and secure not only a safe but an economic distribution. For any merchandise should be handled between the manufacturer and the consumer at the least possible expense in order that a large volume of business may be obtained and that each factor in the path of distribution shall be adequately compensated for services rendered.

In order that this may be accomplished a careful study should be made to insure that a fair profit shall be earned by each factor so that there will be no failures in the scheme of distribution. In a business as new as this errors are bound to occur, but if we all study our own parts with the view to functioning economically, these errors can be minimized and little harm need result. It, therefore, may be helpful to define the function of each factor, and I give you my views for what they are worth.

First: The manufacturer or his selling agency must: (a) Manufacture a high-grade quality article on which he will build his reputation. (b) Put a fair price on his merchandise so as to be able to compete with other high-grade apparatus. (c) Select distributers of unquestionab'e reputation in each territory so he may feel that the dealers, who are the next step in the distribution, will respect the merchandise manufactured. (d) Set up a differential made by the manufacturer in the compensation allowed to those whom I term creative jobbers and to those jobbers who are only order takers. (e) Co-operate with each branch in the distribution to build that unpurchasable asset in any business, good will.

Second: The distributer or jobber must undertake as his duties to: (a) Select a manager for his radio department who has merchandising sense plus technical knowledge. If this combination is not available, then two men must be engaged—one a merchandiser and one a technical expert. (b) Purchase a well-balanced stock with extreme care so that the turnover which is so necessary to economical distribution shall be obtained. (c) Procure a list of reputable dealers and teach them how to study the business in order properly to exploit the merchandise to the ultimate consumer, who, after all, is the goal all other factors are striving to reach economically. I use the word "reputable"—too much stress cannot be laid on this particular point because we shall all stand or fall in a given locality in direct response to the service the dealer renders.

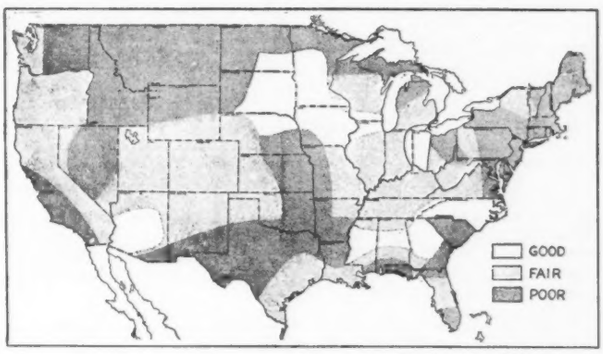
Third: The dealer, as his function: (a) Must have the confidence of his home people and his jobber. (b) Must be well located. (c) Must have in his organization a radio service man and for the first year or two make "policy" service calls at little expense to the consumer to see that the business is not retarded owing to large service expense. (d) Must maintain a representative stock, well displayed. (e) In addition he should do the ordinary things, such as advertising, etc., which are so necessary to the successful upbuilding of any business.

To establish ourselves in this business we have engaged a man who has been in the radio field for several years past, having entered the field as an amateur after constructing his own apparatus. He was for three years connected with the design section, Radio Division, Signal Corps, U. S. A., as lieutenant in charge of that section, and he has also had three years' sales experience in general mechanical and electrical lines. We have placed an order for merchandise which this man thought was a proper stock. We are in a virgin field. Radio is newer to us by three months than it is to New York or Pittsburgh territory. So we have sent out letters to ninety dealers in western Michigan inviting them to a first Radio Congress, at which we will explain to them the opportunities in the business and educate them as much as possible collectively.

We are trying very hard to keep our feet on the ground, though there is so much activity in this line that one would think that the entire electrical business was circling around it. We are trying to be sane and leave the management of a department of this kind to a department manager and let him have all the grief and joy that there is in operating it.

There is, of course, danger that the jobber may be stampeded by the appeal of the opportunity and allow his business to be thrown out of balance, but the answer to that is, after all, organization, and it is important that that organization be well set up to operate through the entire process of distribution. The industry had plenty of experience during the war boom years in the pyramiding of orders and over-extension. It would be unfortunate if we should allow the radio opportunity to be demoralized by over-enthusiasm and under-organization. We must learn the business as we proceed.

Conditions of Engineering Employment



From the *Professional Engineer*.

THIS map, showing the convalescence of engineering employment, is decidedly encouraging to the electrical industry for it means better business. The employment of electrical and mechanical engineers depends largely upon industries and business conditions, which are rapidly improving.

The Impossibility of Jobber Representation in Every Town

BY W. R. HERSTEIN
Vice-President and General Manager Electric Supply Company, Memphis, Tenn.

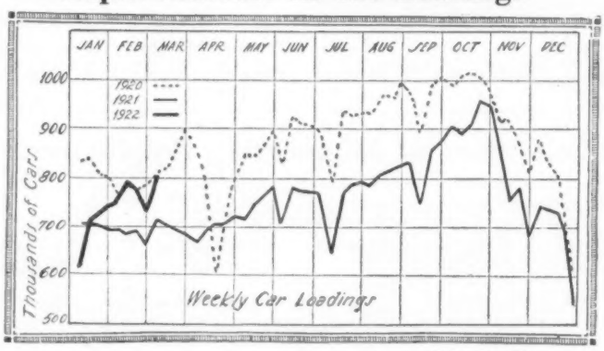
A GREAT many manufacturers feel that unless they are getting business from every town they are not doing their full duty to themselves and their business. In the large centers it is easy for every manufacturer to secure an outlet, but in the smaller towns, where there are only a few jobbers, these jobbers are constantly beset by manufacturers' representatives with the very plausible argument that they desire to do business through the jobbers, but that unless the jobbers will buy from them they will be compelled to pass over the jobbers' heads and solicit business direct from the jobbers' customers. Of course, it is apparent that there are not enough jobbers in these smaller towns to satisfy every manufacturer, and many manufacturers believe that they are fully justified, where the jobber is unable to represent them, in thereupon soliciting business direct from the jobbers' customers.

This creates a situation where a manufacturer is distributing through jobbers in one section of the country but is not doing so in other sections. The jobber says to these manufacturers frankly that they cannot expect to get business in every town. It would be much better for the manufacturers if they would endeavor to secure an outlet for their available capacity in sections where they can do it through jobbers, rather than to break in on established jobbing practices in points where they are not represented. A manufacturer can do only a certain volume of business, and it seems that he should be willing to secure this through established channels, regardless of locality, rather than to make an effort to get business in every town. In other words, if he can sell his entire output, he should be satisfied to do so through his regular jobbers and to "pass up" towns where he can obtain no jobbing representation because there are not enough jobbers to go around.

The same principle applies to jobbers as well as manufacturers. There are towns where we can get no business because the local dealers are already tied up with other jobbers from whom they prefer to buy. In cases of this kind we do not seek to disrupt the dealer's relations with his customers, but we simply leave the town out of our calcuations and try to get business somewhere else, realizing that our capital permits us to do only a certain volume and that we shall make more money if we secure this business where it is easiest to get rather than continue to direct our sales efforts against a stone wall.

If manufacturers and jobbers would simply realize that they cannot get business in every locality and would direct their efforts toward increasing its volume in favorable localities, we believe many of the problems of adequate and satisfactory distribution would soon be capable of solution.

Rapid Increase in Car Loadings



From *Forbes' Magazine.*

MUCH improvement in the general business situation is indicated in this chart showing weekly car loadings for 1920, 1921 and 1922 to March 12. The 1922 record, shown by the heavy line, starts far down at the left, rapidly crosses 1921 and is now up to the 1920 level.

Prevention of Price Cutting Essential to Jobbers' Prosperity

BY AN EASTERN JOBBER

PRICE CUTTING among jobbers serving the market for electrical supplies is a most unwise and undesirable practice. Even representatives of long-established houses are tempted to engage in this occupation under stress of severe competition for business. Not only are quotations shaded to secure the order on materials wanted in published quantities and at so-called standard prices, but prices are "open" all too frequently on quantities which used to be pretty well established as fixed for regional selling figures. While the volume of business is increasing gradually, trade is so eagerly sought that a large volume of business flows at little or no profit. This is clearly most unsatisfactory.

The difficulties of the price situation are well known and need not be enlarged upon. The real problem is how to get upon a better plane of price activities. Fundamentally, it is hard to see why the jobber should not be accorded a larger percentage of the "spread" between the manufacturer's price and the price the ultimate consumer pays the wiring contractor. Why, for illustration, should the jobber be obliged to sell pull sockets at only 33 cents each for which he pays 29 or 30 cents, when the home builder pays 60 or perhaps even 70 cents each for these products? Quantity purchases do not explain this spread, and the jobbers in a given district should stick to their established "going prices" and put these lists and hold these prices at a level obviously more than sufficient to meet the overhead and operating expenses of handling this sort of materials. In my opinion, the contractor-dealer would still make a satisfactory profit if the jobber sold him pull sockets at, say, 35 or 38 cents each, and if this price could be maintained, the jobber's service in maintaining stocks and giving prompt deliveries would be fairly well compensated.

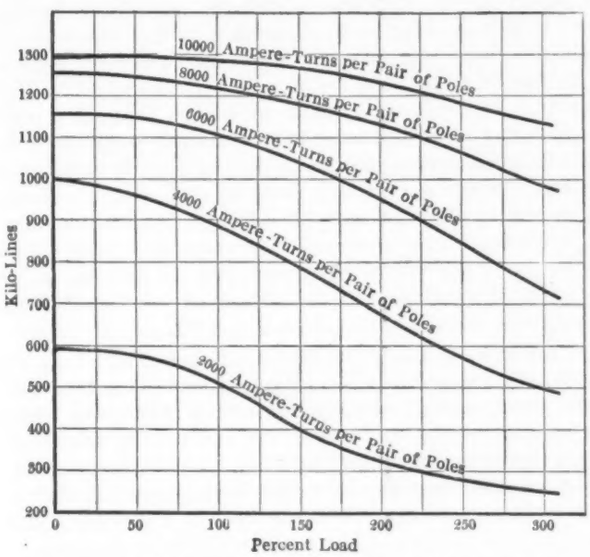
How can prices be maintained? If the United States Supreme Court in the pending Colgate case decides that the manufacturer has the right to fix and to maintain resale prices, a new day will dawn for the jobber. The lower courts have sustained this view, and it is hoped that early this spring the ultimate tribunal will hand down its finding. Should the right to fix and maintain resale prices be established, jobbers will have to live up to a plane of price standardization which should insure a fair profit to all concerned in distribution. Why can we not have more price-courage now?

Digest of Electrical Literature

Including Brief Abstracts of and References to Important Articles Appearing in the Scientific and Engineering Press of the World

Generators, Motors and Transformers

Speed Regulation and Stability of Direct-Current Motors.—SCOTT HANCOCK.—An analysis of the elements affecting the change of speed of direct-current motors upon loading will show (a) why the slight series is used, (b) what should be expected in the speed regulation curve, and (c) how the shape of this curve can be changed. In discussing this problem of speed regulation the author takes up the shunt-field excitation, the



VARIATIONS OF SATURATION CURVES OF A 10-HP. MOTOR WITH DIFFERENT LOADS

armature distortion, the series fields, the position of the brushes and the commutating-field strength. The calculated saturation curves of a 10-hp., 500/1,500-r.p.m. motor at various loads is shown in the accompanying illustration. Regulation curves and curves showing how the flux varies with the load for several constant-field excitations are also given.—*Electrical Journal*, February, 1922.

Generation, Transmission and Distribution

Application of Electric Power in the Iron and Steel Industry.—W. S. HALL.—The general problem of power generation in the steel industry for continuity and reliability of service is considered.—*Paper presented before Association of Iron and Steel Electrical Engineers*, March, 1922.

Determination of the Sag of Overhead Lines with Heavy Insulator Chains.—K. GUERNDT.—A simplified method is given to calculate the tension and the maximum sag of overhead transmission lines for very high voltages, using heavy chains of suspension insulators. The weight of these chains is considered as a part of the weight of the conductors between adjacent towers. The mathematical derivations are illustrated by two concrete examples.—*Elektrotechnische Zeitschrift*, Feb. 2, 1922.

Developments in Power-Station Design.—This article, which is one of a series, deals with power generation, with particular reference to the Bargoed station of the Powell Duffryn Steam Coal Company, Ltd., of England, a station having a capacity of 18,000 kw.—*Engineer (London)*, Feb. 24, 1922.

Increasing Capacity of Parnahyba Plant.—H. P. QUICK.—A description of how a hydro-electric plant originally laid out for 16,000 hp. was modified to develop double this capacity. The station is on the Tiete River, about 20 miles from São Paulo, Brazil. An interesting feature is the combination of two 2,000-hp. generators to operate on one turbine wheel, which is made necessary by replacing the old turbine by wheels of double capacity.—*Power*, Feb. 7, 1922.

Traction

Electrification of the Gotthard Road.—K. SACHS.—The electrification of this important Alpine road, connecting Switzerland and the north with Italy and the south through the famous Gotthard tunnel, has been completed, and, as representing the most up-to-date European single-phase electrification, much has been written about it. The article under notice gives an elaborate and complete description of the entire system, comprising eight installments with a large number of illustrations. The power supply for the road comes from the Amsteg and Ritom hydro-electric stations, which have at present a capacity of 36,000 kva. in four single-phase 9,000-kva. generators, wound for 15,000 volts and 16⅔ cycles. The machines are of Swiss manufacture, but are designed to meet American heating guarantees. Four 10,000-kva. forced-oil-cooled single-phase transformers step the voltage up to the transmission tension of 60,000 volts. The high-voltage oil switches have a rupturing capacity of 250,000 kw. each and have eight breaks per phase. The middle of the high-voltage winding of the transformers is permanently grounded over an air-core reactor. Horn gaps with series water resistances are used as overvoltage protection. Two overhead and two cable lines for 60,000 volts connect the power houses with each other and the road substations, of which there are at present five. Each of these contains two single-phase, 5,000-kva. oil-cooled transformers. The oil switches in the substations can break safely 150,000 kva. each and are equipped with auxiliary contacts. A catenary suspension system is used on the entire road, with a "figure 8" copper conductor and two carrier cables of galvanized steel. Zinc-coated (Schoop process) structural steel poles support the power line in the open stretches, while a special roof suspension is employed in the tunnel. To avoid encumbering stations with too many poles a light bridge construction is held up only by two outside towers, crossing several tracks. An electrically interlocked blocking system, similar to the Mertz-Price dif-

ferential cable protection method, is used for the entire line. A minute description is given of the different types of freight and passenger service locomotives operating on the road. Their weight is almost uniformly kept to 6.75 tons per over-all meter length. All motors are geared, high-speed commutator motors not exceeding 700 hp. per motor, driving the wheels over a jack shaft and rods. Special attention is called to several very ingenious methods of obtaining an elastic drive between the power shaft and the wheels. Assembly drawings of the locomotives and complete wiring diagrams conclude the paper.—*Elektrotechnische Zeitschrift*, Jan. 5, 12, 19, 26, Feb. 2 and 9, 1922.

Installations, Systems and Appliances

Electric Driving in Scottish Woollen Mills.—A. W. STEVENSON.—The author considers conditions prevailing in the machine drive of the Scottish woollen mills. This is a localized industry where water power is often available in sufficient quantities or can be economically supplemented by the public electricity supply. The claims of steam driving under these conditions are considered, and the various processes necessary to produce the finished wool product are described in detail.—*Electrician (London)*, Feb. 24, 1922.

Electric Trucks for Cargo Handling.—G. H. RAE.—The author gives a description of cargo handling with electric trucks such as are now being used on English docks. Operating data with fixed charges and investment cost are given, showing the annual saving made possible.—*Electric Vehicle*, February, 1922.

Electrophysics and Magnetism

Theory of the Intrinsic Field of a Magnet.—J. R. ASHWORTH.—This is a treatise on the theory of the intrinsic field of a magnet and the relation of its magnetic to its characteristic electric and thermal properties. The inconsistencies of the ferro-magnetic equation based on the kinetic theory of magnetism disappear if the intrinsic field is treated as a combination of two fields, one a molecular field and the other a true magnetic field. This view of a twofold field explains why the critical temperature is lowered by an alternating magnetic field, while the temperature at which the specific heat changes is but slightly affected. This view also gives a reasonable account of the relations of mechanical and magnetic forces and shows why elastic and magnetic qualities tend to disappear at the same high temperature. It removes a serious defect in the former statement of the kinetic theory of magnetism and now allows consistent values to be calculated from the ferro-magnetic equation. The abnormal rise of specific heat and the abnormally large temperature coefficient of resistivity found in these metals are also explained by the theory of two fields—*Philosophical Magazine (London)*, March, 1922.

Units, Measurements and Instruments

Distribution of Voltage Along Disk-Type Insulators.—G. VIEL.—The various methods devised and actually carried out to measure the voltage gradient experienced with chain-type insulators differ in their results as much as 30 to 55 per cent. Most of these methods are strictly laboratory measurements, and it would be difficult, if at all possible, to duplicate them outdoors along an energized line. The author has devised apparatus for measuring this gradient which is suitable for use in the field. To determine, for example, how much of the total line voltage is taken up by the disk next to the line, he connects the terminal of a static voltmeter to the connecting cable or other metal part between the line disk and the next disk. Energizing the line after the voltmeter is grounded will cause a certain deflection of the voltmeter. Then the ground connection of the casing is removed, and the line itself is connected to the voltmeter casing. The line voltage is now so regulated that the deflection on the voltmeter will be the same as before. From the line voltage and the voltage indicated on the meter can be obtained the percentage of line voltage upon the first chain link. This method assumes that the percentage of voltage gradient along the chain does not change with the applied voltage, which is actually the case for voltages above 50 kv.—*Revue Générale de l'Electricité*, Feb. 25, 1922.

Telegraphy, Telephony and Signals

Shape and Phase of Waves from Tube Senders.—E. ALBERTI and G. ZICKNER.—With the aid of the Braunian tube a qualitative investigation of the theoretically derived shape and phase of waves of extremely excited tube senders has been made, and it is described in this paper. All tests were made with high frequency, corresponding to wave lengths of between 1,000 m. and 18,000 m., according to the method of Lissajous' figures, using sinusoidal auxiliary fields to deflect magnetically and electrically the cathode rays of the Braun tube. The obtained photographic images are all of the closed polar form and have been reconstructed into the more familiar co-ordinate form.—*Jahrbuch der Drahtlosen Telegrafie und Telefonie*, January, 1922.

Decisions of the Paris International Conference on Radio Communication.—G. VALLAURI.—The author tells how the decisions of this conference affect the characteristics of radio transmitting stations in respect to their emissions and nominal range. The recommendations of the committee for the distribution of various wave lengths are given.—*Radio Review*, February, 1922.

Miscellaneous

A Review of Hydro-Electric Progress in Canada.—A résumé shows that the progress in hydro-electric development in Canada last year was very satisfactory. Reports indicate that 300,000 hp. was installed. The most important of these additions is the Queenston-Chippawa plant of the Hydro-Electric Power Commission of Ontario, involving the installation of two 60,000-hp. units. The new installations in the individual provinces have been approximately: Nova Scotia, 13,000 hp.; New Brunswick, 9,000 hp.; Quebec, 90,000 hp.; Ontario, 174,000 hp., and Manitoba, 14,000 hp.—*Canadian Engineer*, Feb. 21, 1922.

DEVELOPED AND AVAILABLE WATER POWER IN CANADA

Province	Turbine Installation in Hp., to Jan. 1, 1922	Available Twenty-Four Hour Power at 80 per cent Efficiency At Ordinary Minimum Flow, Hp.	Available Twenty-Four Hour Power at 80 per cent Efficiency Dependable for Six Months, Hp.
British Columbia	305,315	1,931,142	5,103,460
Alberta	33,187	475,281	1,137,505
Saskatchewan	.....	513,481	1,087,756
Manitoba	97,247	3,270,491	5,769,444
Ontario	1,212,650	4,950,300	6,808,190
Quebec	1,015,385	6,915,244	11,640,052
New Brunswick	30,180	50,406	120,807
Nova Scotia	46,948	20,751	128,264
Prince Edward Island	1,869	3,000	5,270
Yukon and Northwest Territories	13,199	125,220	275,250
Total	2,755,980	18,255,316	32,075,998

News of the Industry

Chronicle of Important Events and General Activities in the Technical, Commercial and Manufacturing Fields With Announcements and Reports of Association Meetings and Conventions

Senate Opposed to American Valuation Plan

INITIAL discussion of the tariff bill in the Senate reveals that there is practical unanimity of opinion in that body that the ad valorem rates in the bill should be based on a valuation made in the country of origin. Sentiment in the Senate seems to be as strongly opposed to American valuation as that of the House is in favor of it. Approximately 60 per cent of the commodities covered by the dutiable list take ad valorem rates. The remainder of the articles on the dutiable list are covered by specific rates.

The Government Would Control the Colorado River

A BILL providing for the protection and development of the lower Colorado River basin was jointly introduced by Representative Swing of California and Senator Johnson of that state on April 26. The measure is said to have the backing of Secretary Hoover, the American Federation of Labor and other national organizations. It provides that the United States shall have the exclusive right to construct, provide and control dams, reservoirs or diversion works upon the main trunk of the Colorado River below the mouth of the Green River.

Authorization is given to the Secretary of the Interior to construct a dam and incidental works for the purpose of providing a reservoir at or near Boulder Canyon and to acquire by proceedings in eminent domain all lands and rights-of-way necessary. A main canal and the pertinent structures located entirely within the United States will connect the Laguna dam on the Colorado River with the Imperial Valley and vicinity in California. Applications for the right to use portions of the water discharged from the reservoir for the generation of electricity may be made to the Secretary of the Interior, who, after hearings, may allocate to applicants such portions of the power privileges as in his judgment may be consistent with an equitable distribution among interested states and communities.

The leases for power privileges so allocated are limited to fifty years, and preference must be given to applications made by political subdivisions. It is provided in the bill that the Secretary shall give consideration to the plans of the various applicants, having regard to their relative adaptability to use such power privileges in the public interest and at reasonable cost to the communities served. If so desired, political subdivisions may, in lieu of a lease, pay to the United States in annual installments for a period not exceeding twenty-five years a sum proportional to the cost of the undertaking plus a like proportion of the annual expense of operation and maintenance, with interest at 5 per cent per annum on the unpaid portion of such proportionate part of the cost.

It is stipulated in the measure that the dam and reservoir are to be used first for river regulation and flood control, second for irrigation, and third for power. Veterans of the world war and the Spanish-American war are to have the exclusive preference to acquire home sites on the irrigated lands.

Senate Committee to Hold Hearings on Trade Association Regulation

THE Senate judiciary committee has appointed a sub-committee consisting of Senators Cummins of Iowa, Nelson of Minnesota and Walsh of Montana to give hearings and report on the bill of Senator Edge, New Jersey, defining the status of trade associations and placing them under jurisdiction of the Federal Trade Commission.

St. Lawrence Seaway Project Criticised at A. I. E. E. Convention

STRONG criticism of the plan of development of the St. Lawrence seaway proposad by the Joint International Commission was voiced by Hugh L. Cooper, consulting engineer of New York, in the discussion of the subject before the spring convention of the American Institute of Electrical Engineers at Chicago on Friday of last week. The development as proposed in the report was criticised as having too many dams and too many miles of canal, while the means of handling the ice problem were characterized by the speaker as absolutely inadequate. By a scheme of development proposed by Mr. Cooper it was claimed that there would be an increase of 850,000 hp. over that in the plan of the joint commission. The speaker asserted that the development could never be carried out under the plans of any one man, but because of its size must be finally constructed from plans reviewed and approved by a commission of the best engineering talent available.

Representative Dempsey, chairman of the committee on rivers and harbors of the House of Representatives, characterized the project as a vision, while Henry I. Harriman, chairman of the Massachusetts Commission on Foreign and Domestic Commerce and president of the New England Power Company, spoke in favor of it.

The paper by H. C. Louis, Consolidated Gas, Electric Light & Power Company of Baltimore, and C. T. Sinclair, Pennsylvania Water & Power Company, on the effect of high currents on disconnecting switches brought out an interested discussion. The tests were directed particularly at the determination of the stresses which under high-current conditions tend to force the switch blades open and those stresses that tend to spread the supporting insulators apart and thus aid in

breaking the switch contacts and causing destructive arcing. Results of the tests showed that a type of switch in which the conductors and the switch blades are in the same plane is less liable to serious difficulties than other types. Conductors coming in from below the level of the switch blade and paralleling the supporting insulators of the switch before connecting to the lugs, it was contended, produce undesirable reactions under heavy current flows, and buses installed close to the switches tend to produce additional strains. It developed from the test that many types of locks used to keep disconnecting switches closed are inadequate and may be partly or totally destroyed by the mechanical strains imposed on them under short-circuit conditions. The tests were made with peak ampere values of from 34,000 to approximately 150,000, with corrections running in some cases up to approximately 200,000 peak amperes owing to the arrangement of the conductors leading to the switches.

PRACTICE OF CLEVELAND COMPANY

In the discussion B. G. Jamison emphasized the need of considering the arrangement of other conductors in the design and installation of disconnecting-switch installations so as to prevent imposing unnecessary strains. It has been the practice of the Cleveland Electric Illuminating Company, H. L. Wallau said, to place locks on main circuit switches, but not on the disconnecting switches in potential transformer circuits, as it had been found that the wire used in these circuits because of its small size would burn off before the current values became sufficient to affect the switches. The danger involved in the failure of operators to close switches properly, so that the locks are latched, was pointed out, and it was asserted that switches equipped with locks that must be latched before the operator can remove the pole or other device with which the switch is closed have been developed but have not so far proved very popular. It was also asserted in the course of the discussion that the difficulties that had developed with the locks in the tests were not so serious as might be thought, because in many tests the peak currents were, owing to insufficient plant capacity, not of a degree that would be serious to the switches. In closing the discussion the authors stated that, while the tests were incomplete in many particulars, good progress had been made.

On Thursday morning Dr. Karl W. Wagner, head of the insulator research division of the Post Office Department of Germany, presented a discussion of the characteristics of insulation.

A report on the symposium held Thursday afternoon on the transmission of energy from coal mines to large centers of distribution, to which prominent electrical engineers contributed, has been withheld for correction of possible stenographic errors.

Karl B. McEachron, Purdue University, presented the results of his experiments to determine the position of the main and leakage fluxes in transformers. Using belt exploring coils under both the primary and secondary windings, the oscillographic curves showed that the leakage fluxes are not found as separate fluxes. In discussion, J. E. Clem of Pittsfield said that while the presentation of these fluxes to students had been clouded, analogies should not be proposed unless the conventional terms were clearly explained. The entire subject, he felt, should be considered from the point of view of the value of the main flux in the core necessary to maintain the secondary induced voltage, and not so much from a leakage standpoint.

In the discussion of the paper by J. F. Tritle, General Electric Company, on air-break magnetic blow-outs, H. D. James of Covington, Ky., favored the use of transverse barriers because the arc stream was much better controlled. With the addition of copper tips on these barriers the cooling effect is increased. Without these barriers it was found that greater flux densities were required to snuff the arc. Mr. James considered the proper design of the gas vents an important one. E. E. F. Creighton of Schenectady, N. Y., spoke on the effect of inserting a group of parallel barriers perpendicular to the path of the arc and stated that the points offered very excellent means for cooling and quenching the arc.

The Friday morning session was devoted to the question of selection of electrical apparatus for cranes and controllers on both passenger and freight elevators. D. L. Lindquist, Otis Elevator Company, in the discussion of the paper by H. P. Reed, Cutler-Hammer Manufacturing Company, on electric elevators listed four important factors to be considered by designers. Primarily, he said, the service should be adequate for a particular type of operation. Then reliability of this service must be maintained by the proper selection of equipment and controllers. Next the question of operating costs should determine the selection of economical equipment. Finally comes the quality or smoothness of the service. This quality is variable since more care must be exercised along these directions if the service is intended for a hospital than if it is for office buildings and high speed is required. Mr. Lindquist insisted that every new installation is a distinct new problem in itself and must be treated accordingly. He predicted that for certain installations schedule speeds would soon be as high as 1,000 ft. per second.

H. D. James drew attention to the introduction of suitable inductance in the control circuits in order to obtain a smoother rate of acceleration.

University Student Invents Average-Kva. Demand Meter

GEORGE SPERTI, JR., a fourth-year student in the co-operative course in electrical engineering at the University of Cincinnati, has just disposed of the United States rights covering a new meter for which a patent is being sought. The development of this new meter is the direct result of his co-operative experience with the Union Gas & Electric Company. He is employed in the meter department of the company and naturally has come into direct contact with metering problems enough to appreciate the importance of determining the kilovolt-ampere demand. It is only a little more than a year since he studied the theory underlying the various meter connections proposed and in use for metering power installations.

The new device, which is remarkably simple, involves the use of two standard polyphase meters, one connected to read kilowatt-hours and the other to read reactive kilovolt-ampere-hours. By connecting the two meters together by means of link work, Mr. Sperti has been able to indicate the following values: (1) Kilowatt-hours; (2) reactive kilovolt-ampere hours; (3) average power factor for any interval; (4) average reactive-kilovolt-ampere demand for any interval; (5) average

kilowatt demand for any interval; (6) average kilovolt-ampere demand for any interval. Any combination of these can be shown. The usual combination will probably be of (1) and (6). The original model built by Mr. Sperti and tested by the Union Gas & Electric Company was made with this combination.

One interesting feature of the meter mechanism is the provision made for obtaining positive rotation of the reactive element under all conditions. A reversing-gear combination was built into the original model so that the reactive kilovolt-ampere-hours will always be indicated. While Mr. Sperti deserves entire credit for the idea involved, as soon as its value became apparent he received valuable assistance from his foreman, Mr. Blecksmidt, and from Mr. Freyer, the head of the meter department of the company.

Public Hearings on 660-Watt Rule Being Held by N. F. P. A. Committee

MORE than thirty delegates from various national and local organizations appeared at the public hearing given in Chicago on April 18 by the electrical committee of the National Fire Protection Association on the regulation known as the 660-watt rule. Many suggestions were offered, the majority of which assumed recognition by the committee of a general demand for a change in this rule (23d) of the National Electrical Code that would permit a greater current load on the ultimate branch-lighting circuit.

It has been decided to hold a second hearing in New York City on Friday, May 19, beginning at 10 a.m., in the assembly rooms of the New York Board of Fire Underwriters, 123 William Street. In particular it is suggested that those who feel that the 660-watt limit should be continued attend this hearing and express their views.

Advocates of Bacharach Bill Are Heard by House Judiciary Committee

ANOTHER hearing was held in Washington before the House judiciary committee on Tuesday to consider the Bacharach bill, which would limit the jurisdiction of federal courts as to injunctions in matters pertaining to state public utility orders. The hearing was held before the whole committee, the time being given to the advocates of the measure. Another hearing will be held May 23. Mayor Hylan of New York, Ledyard P. Hale, counsel for the New York State Public Service Commission; John P. O'Brien, Corporation Counsel of New York, and John E. Benton, representing the National Association of Railway and Utilities Commissioners, were among those who appeared before the committee. Among those who listened to the testimony offered at the hearing were E. A. Harriman, member of the legislative committee of the American Bar Association, and Senator Charles S. Thomas of the Bar Association of Colorado.

The witnesses in behalf of the bill voiced the complaint that state commissions are interfered with by the federal courts. They claimed that as exact justice can be had from the state administrative bodies and the state courts as from the federal courts. The indicated answer to this contention is that, while it is doubtless true in local matters, non-resident investors very naturally look to the federal courts for protection.

Mayor Thompson of Chicago is to be heard on May 23, when the hearings on the measure will probably end. It was evident at the hearing that the opposition to the bill is very strong, especially in states where money is wanted for the extension of railroads and the development of natural resources. It was announced at the hearing that the committee had received telegrams from a number of state commissions opposing the bill on the ground that it would have a tendency, if enacted into law, to exclude capital from public utility enterprises.

Congress May Put Muscle Shoals' Disposal Up to Secretary Weeks

EXCEPT for a brief hearing on the Engstrum offer, no public hearings on Muscle Shoals were held before congressional committees this week, but behind the closed doors of the committee rooms developments which have brought the negotiations further along took place. As this is written it is indicated that the net result of the investigation by the House military affairs committee will be that the committee will find itself unable to recommend to the House the acceptance of any proposal and will advocate general legislation empowering the Secretary of War to act as he deems best in regard to the whole series of questions involved in the Muscle Shoals development.

One of the most important developments was the appearance before the military affairs committee of representatives of Mr. Ford to make additional modifications and alterations in his offer. This conference, which was in executive session, confirms recent dispatches to the ELECTRICAL WORLD to the effect that the Ford offer could not possibly be favorably reported by the committee in the shape in which it was submitted and argued.

What Mr. Ford's new modifications are had not been made public at the time this was written, but it is understood that a number of members of the committee feel that Mr. Ford in the final analysis will not be willing to undertake all the requirements the committee will probably attach to new negotiations. Some of these requirements were outlined in the ELECTRICAL WORLD in its recent report of the "informal conversations" of the committee. These conversations are continuing. Some members of the committee feel that, irrespective of Mr. Ford's new modifications, the requirements of the committee will be such that Mr. Ford may decide to withdraw his offer. The members of the committee in large number, in fact, think that its final requirements will make additions that it will not be possible for any bidder to accept, and they are turning toward general legislation as perhaps in this case the only solution of their problems. This solution is not likely to come for at least three weeks, in the opinion of Chairman Kahn.

Some members of the committee are pressing for the inclusion in its requirements that the power to be developed at Dam No. 2 and Dam No. 3 not required or used for nitrate manufacture shall be disposed of only under the terms of the federal water-power act, except that any purchaser or lessee agreeing under satisfactory guarantees to operate Nitrate Plant No. 2 at its capacity of approximately 110,000 tons of ammonium nitrate per annum during a period of a hundred

years may receive a license for the same period, all the other terms and conditions of the federal water-power act to apply in such case.

Other members of the committee are urging that the government shall not guarantee to transfer clear title to any property which might become the subject of litigation as the result of any outstanding agreement executed by the contract officers of the government, whether such agreement is deemed valid or invalid, and that the government shall transfer only its right, title and interest in such property.

Still other members declare that if any bid requires the expenditure of additional government funds all new expenditures by the government must be included in the amount upon which interest must be paid and which must be returned to the government through amortization payments during the term of contract, and that each such bid must also contain suitable guarantees that all expenditures over and above a sum fixed in the bid shall be assumed and paid by the bidder and not by the government.

All three of the stipulations just mentioned are, of course, anti-Ford propositions. Naturally they do not receive the support of the Ford men on the committee, but it is stated in Washington that there is a growing sentiment among members of the committee that Mr. Ford should be required to come under the federal water-power act. Mr. Ford has heretofore refused to come under this law, largely, it is believed, because of that feature of it which provides for the expropriation of excessive profits. The point regarding the guaranteeing of clear title refers to the Gorgas plant on the Warrior River, part of which belongs to the government and part to the Alabama Power Company, and Nitrate Plant No. 2, at Sheffield, Ala. In the first case the Alabama Power Company has a contract to purchase the government property, and in the second the Air Nitrates Corporation has a contract to purchase the plant.

Mr. Ford's representatives during the week obtained a delay as regards appearing before the Senate committee, and its hearings were adjourned until next Monday.

Census Data on 1919 Industrial Power Requirements

CENSUS figures grouped a special way for use by the Senate in its study of the tariff indicate that in 1919 68.2 per cent of industrial power requirements was supplied from isolated plants while 31.8 per cent was supplied by central stations. When the 1919 census was taken there were 290,105 industrial establishments being operated in the United States, with an aggregate horsepower rating of 29,575,242.

At 237,855 of these plants 116,158 steam engines furnished 13,839,744 hp.; 6,472 steam turbines furnished 3,258,235 hp.; 33,407 internal-combustion engines furnished 1,259,394 hp.; 13,244 waterwheels furnished 1,753,548 hp., and 817 water motors furnished 22,165 hp. In addition to the foregoing equipment, which is owned by the establishment, 9,442,156 hp. is furnished by rented equipment. Of that amount 9,347,556 hp. is furnished to 996,000 electric motors. The total number of electric motors in use in these plants is 1,483,039, with an aggregate rating of 16,317,383 hp. The number of motors run by energy generated in the establishment is 487,039. Their combined horsepower is 6,969,827.

The capital invested in the industrial plants of the country in 1919 was $44,688,093,771. They employed 10,160,107 wage earners and 1,447,227 salaried employees.

The amount of fuel used by these industrial plants is as follows: Bituminous coal, 203,452,724 short tons; anthracite coal, 14,545,300 long tons; coke, 142,764,287 short tons; oil, 92,608,186 barrels; gasoline, 2,344,469 barrels; natural gas, 305,768,321,000 cu.ft.; manufactured gas, 38,522,330,000 cu.ft.

First of Business Development Campaign Booklets Circulated

AFTER many weeks of preparation and planning the business development campaign of the electrical industry inaugurated by the National Electric Light Association is now under way. The first two of a series of instructive booklets were circulated this week and others are about to follow.

First, as a guidebook, a sixteen-page pamphlet on organization, or "how to get started," was issued. The second booklet is devoted to lighting and is sent out merely as a guide, telling in a general way of sixteen methods of interesting the public in more and better lighting.

The Probabilities of State Ownership in California

WHETHER or not California will vote $500,000,000 at the November election for state ownership of water power is of vital concern to that state and of interest to the country as a whole. The ELECTRICAL WORLD has accordingly made a poll of the principal newspapers of California to ascertain their editorial position on the proposed measure. Editors were asked whether they favored the passage of the bill, whether they opposed it, or whether any definite policy had been announced. Of the 102 papers replying, only eleven favored the passage of the act, while forty-nine opposed it. Forty-two papers have thus far adopted no definite policy on the matter, but of these eight or ten indicated that they would probably oppose the bill. The total circulation of the eleven papers which favor the passage of the act is 111,593, and of the forty-nine opposing the proposed bill 522,542. The circulation of the forty-two papers which have not as yet announced a definite policy is 558,354, and that of the several papers which may later come out against the passage of the bill 248,646. Thus the total circulation of those papers opposing the passage of the bill will be 771,000 as compared with 111,593 the circulation of the papers favoring the bill. Although the poll did not cover all of the papers of the state, it did cover all of the principal papers and it represents all parts of the state.

In addition to the majority of influential papers opposing the bill are a large number of security holders residing in the state who have investments in the public utilities of the state. These total more than 75,000, and it is estimated that each will also influence the votes of close acquaintances. Added to this are the employees of the utilities of the state, who are in general also investors in the securities of their companies.

At the last presidential election the total vote cast in California was 918,000, but it is not anticipated that the vote at the coming election will exceed 600,000.

Federated Engineering Societies' Officers Confer with President

THE work of the Federated American Engineering Societies was discussed recently when Mortimer E. Cooley, the president of the federation, and L. W. Wallace, its executive secretary, conferred with President Harding. The President showed keen interest in the organization and recalled the part which Secretary Hoover took in its formation.

Dean Cooley told the President that the organization would concentrate attention in the immediate future on reforestation, elimination of waste in American agriculture and industry, and on the reorganization of the executive departments of the federal government.

Conference Called on Colors for Traffic Signals

A CONFERENCE has been called for May 23 at the Engineering Societies Building, New York, by the American Engineering Standards Committee in accordance with requests received from the Illuminating Engineering Society and from the International Traffic Officers' Association to determine the desirability of standardizing the colors used for traffic signals.

The status of the subject and the facts bearing on it as they exist in the automobile, steam railway, electric railway and regulatory commission fields will be outlined in a few brief papers in order to lay a proper foundation for discussion of necessity for and feasibility of developing standard colors for traffic signals.

New Jersey Company Plans Heavy Construction Program

THE Public Service Electric Company, which serves the major part of New Jersey, is planning some extensive additions to its system this year and next. This is a development made necessary by the cessation of construction work during the war. The construction program contemplates an addition to the Essex station which will practically double its size. The new equipment planned includes three 33,000-kva. generators, two of which are to be installed this year; one 25,000-kva. unit for the Marion station and one 12,500-kva. unit for the Burlington station, both to be installed this year. In addition, two new substations are to be built and the transmission lines reinforced. The company has also started the establishment of a four-wire, three-phase distribution system. Provision is made for additions and improvements to existing substations. Contracts have already been let for four of the five generating units and the auxiliary apparatus.

State Department Inclined to Revive German Patent Convention

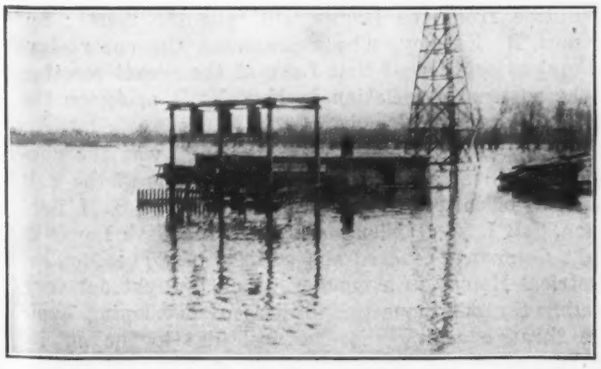
AFTER having reviewed the arguments for and against the revival of the patent convention with Germany, the State Department is understood to be inclined to revise the treaty under the authority conferred by the Senate. The Senate committee on patents will reopen its hearings on the working-clause bill on May 1.

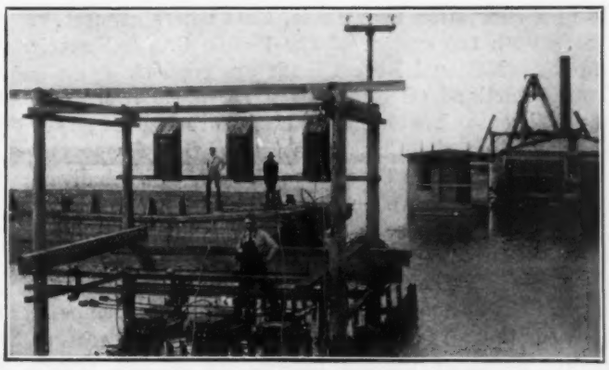
Report of Engineering Standards Committee Shows Great Progress

DURING 1921 the activities of the American Engineering Standards Committee developed to such an extent that work is now under way on seventy-nine distinct projects which have reached an official status. The report of the committee for last year is now available in printed form. In its work 160 bodies of national importance are co-operating, these having designated more than 500 individuals as official representatives to serve on sectional committees.

During 1921 the committee approved fifteen standards, among which were a standard method for sampling of coal, the National Electrical Code specifications for soft or annealed copper wire, and the industrial lighting safety code. Seventeen standards were formally before the committee for approval on Dec. 31.

Middle West Floods Bring Operating Difficulties





HIGH water occurring simultaneously on a number of streams entering the Mississippi River have brought about some unusual flood conditions. Levees have gone out here and there, and at one place land as far back as 10 miles from the river was covered. Reports from the big Mississippi River Power Company project at Keokuk state that the high water is causing no difficulty there.

The accompanying pictures show the situation at places on the Canton (Ill.) Gas & Electric Company's system due to breaking of levees along the Illinois River. The transformers were raised 4 ft. above the concrete base in anticipation of high water. But this precaution was not enough, as will be seen from the pictures. At the points where these transformers stood the water was about 10 ft. deep. In order to save them it was necessary to take them out and load them on the barge that is seen moored beside the substation. We are indebted to E. H. Negley, secretary and manager of the Canton Company, for the pictures used.

Five Pacific Coast Water-Power Projects Licensed by Commission

THE Federal Power Commission has granted a license to the Southern California Edison Company covering that part of its proposed power project on the Kaweah River lying outside the Sequoia National Park. The entire project was covered by the permits granted to the Mount Whitney Power Company by the Department of the Interior and by the Department of Agriculture. The Interior Department's permit covered that part of the project lying within the national park. The Southern California company purchased the rights of the Mount Whitney company and applied to the two departments for a transfer of the permit. This transfer was approved by the Department of the Interior in August, 1920, but the Secretary of Agriculture declined to approve the transfer granted by his department on the ground that the passage of the federal water-power act rendered him without authority to act in such a case. The Attorney-General then decided that the matter now comes under the jurisdiction of the commission.

Another license has been granted to the Southern California Edison Company covering its thirteen-million-dollar project on the San Joaquin River in Fresno and Madera Counties, Cal. The primary power available is 112,000 hp. Construction will include a concrete arch dam 100 ft. high and a tunnel 21 ft. x 21 ft. and 28,000 ft. long. The power house will contain six turbines which will operate with a mean static head of 825 ft. They will be capable of developing 195,000 hp. There will be two parallel 220,000-volt transmission lines, 1½ miles long, which will connect the power house with the double transmission line to Los Angeles.

The Southern Sierras Power Company of San Francisco has obtained a license from the commission to cover two developments on Snow Creek and its tributaries in Riverside County, Cal. The projected construction in one case includes 3 miles of 18-in. conduit and a 2,000-kva. power house operating under a head of 1,838 ft. In the other case it is planned to install a mile and a half of 30-in. conduit and a 1,500-kva. power house operating under a head of 868 ft.

A license has been issued to the California-Oregon Power Company of San Francisco covering three short sections of a constructed transmission line from Cantella to a substation near Delta, Cal., where connection is made with the system of the Pacific Gas & Electric Company. National Forest lands are crossed.

To the Portland (Ore.) Railway, Light & Power Company a license has been granted covering a power development on the Clackamas River, Oak Grove and Three Link Creeks in Clackamas County, Ore. A diversion dam on Oak Grove Creek, a conduit 8½ miles long, a 20,000-kw. power house, a small diversion dam on Three Link Creek, and 24 miles of transmission line are the main features. The transmission line will connect with the existing system of the company. The company requested that its license cover a reservoir site at Timothy Meadows on the headwaters of Oak Grove Creek, but as no permit had been issued by the state covering that part of the project, it was not included in the license. The commission, however, authorized a preliminary permit covering a reservoir in the Clackamas River above the power house. Water from that reservoir will be diverted to the intake on Oak Grove Creek, which will lead to the power house.

Preliminary permits have been issued to Frank G. Baum of San Francisco covering two projects on the Little Colorado River, and another to Mushen & Cronemiller of Lake View, Ore., to cover a proposed power development on Deet and Cammas Creeks in Lake County, Ore., a total of 800 hp.

Stay of Injunction in Langmuir Patent Case Denied

APPLICATION by counsel for the Continental Lamp Works for a stay of injunction from manufacturing gas-filled lamps covered by the Langmuir patent was argued before Judge Mack on Friday of last week and was denied. Formal orders have now been entered restraining the Continental Lamp Works and also the United Lamp Manufacturers' Corporation from infringing upon the Langmuir patent.

Intermountain Electrical Men Hold First Annual Conference

UNDER the auspices of the Rocky Mountain Electrical Co-operative League, the first annual conference of representatives of the various branches of the electrical industry in the Intermountain States was held at the Newhouse Hotel, Salt Lake City, April 6 and 7. Many of the problems confronting the contractor-dealer, the jobber, the manufacturer, the central-station company and the public in general were discussed.

L. B. Johnson of the General Electric Company, in a paper on "Fundamentals of Electrical Retail Merchandising," pointed out how increased sales and increased net profit could be obtained through better merchandising methods. "The Business Outlook" was the subject of a talk by C. E. Arney, Jr., of the Seattle Chamber of Commerce, who spoke of the psychological factor in the business depression.

P. L. Goddard, who has recently assumed the duties of secretary of the league, summarized its work since its organization and outlined a program of activities for the future. R. J. Dinwoodey of the Intermountain Electric Company of Salt Lake City urged that an electrical exposition be held in that city in October. A committee from the league will take the matter up. Edward H. Eardley, who represented the contractor-dealers' association of Salt Lake at the recent meeting of the national association in New York, spoke on the work of the national body.

"Industrial and Commercial Lighting" was the subject of an illustrated paper by E. A. Evans of the Salt Lake City office of the Westinghouse company. H. M. Ferguson, Salt Lake division manager of the Utah Power & Light Company, covered the subject of "The Modern Electrical Home" in a manner which brought out very forcibly the enormous possibilities of developing business through selling the electrical idea to the public. He suggested the organization of educational classes through the league, to be attended by meter readers, wiremen and others who come directly in contact with the public. Mr. Ferguson also recommended the appointment of an inspector by the league, whose duties would be to approach the owners of homes in course of construction or those who contemplated building homes and advise them as to proper wiring plans.

Current News and Notes

Timely items on electrical happenings throughout the world, together with brief notes of general interest

Kentucky & West Virginia Power Extends Facilities. — Improvements to the system of the Kentucky & West Virginia Power Company to cost $500,000 have been contracted for. These include an additional 12,500-kva. turbine and other equipment at Lothair, Ky.

Municipal Plant Wants to Increase Rates.—The city of Fairview has filed a petition with the Public Utilities Commission of Utah, asking permission to increase rates charged by the municipal power plant from 7 cents to 8 cents per kilowatt-hour for residence lighting and about 10 per cent for other uses. It is set forth that the city wishes to install a system of discounts for prompt payment, but is unable to do so on the present revenue.

France Has Ambitious Electrical Schemes.—The Superior Council of Public Works of France has prepared a program for the construction of electric generating stations with a total rating of 1,370,000 kw. and a high-tension transmission system extending between 9,000 and 10,000 miles. The cost is estimated at 15,000,000,000 francs, to be spread over fifteen years, but it is doubtful whether the execution of the plan in so short a period is seriously contemplated, despite the desire of the government to make France independent of imported fuels.

Drying Hay by Electricity.—A process of drying hay by electricity has been worked out successfully in Switzerland, according to advices to the Department of Commerce. The newly cut hay is packed in silos between metal sheets. The sheets are connected to an electric circuit so that an alternating current of from 200 volts to 500 volts is passed through the hay between them. The effect of the current is to kill the microbes which cause damp vegetation to decay. From 130 kw.-hr. to 200 kw.-hr. is required to complete the drying process.

District of Columbia Commission Seeks Way Out.—The Public Utilities Commission of the District of Columbia has requested the United States Supreme Court to set for hearing at an early date in its next term, beginning in October, 1922, the commission's appeal from the decision of the Court of Appeals of the District of Columbia reversing the action of the lower court in sustaining the valuation of the property of the Potomac Electric Power Company made by the commission. The case entered the courts after the commission reduced the domestic rate for electricity from 10 cents to 8 cents per kilowatt-hour, and there is now $2,500,000 impounded under the injunction obtained by the company. The commission asserts that it finds itself embarrassed in the exercise of its rate-making powers by the law's delay.

Hydro-Electric Development in Ceylon.—The government of Ceylon is seeking to have the British Colonial Office appoint an expert on hydro-electricity to act as chairman of the Laxapanar-Aberdeen project, from which it is hoped to derive 75,000 hp. The electrification of suburban railways is also contemplated, at a cost of £1,000,000.

India Has More than 400 Engineers of High Professional Standing.—The Institution of Engineers, which was founded eighteen months ago in India, imposed high professional qualifications on its members, but has, notwithstanding, already a roster numbering more than 400. Subsidiary bodies exist at Bombay, Calcutta, Madras and in other centers of population.

Direct Radio Communication with Sweden.—Direct radio communication between the United States and Sweden is said to be virtually assured through an agreement between the directors of the Swedish State Telegraph Board and the Radio Corporation of America as a result of which the board has proposed to the Swedish government that the building of the large radio station planned for the west coast of Sweden be immediately started. Radio messages between that country and the United States have hitherto mainly been transmitted and received via the station at Stavanger, Norway.

Federal Government Buys Electricity for Less than It Costs to Generate It in National Plant.—Testimony by the officer in charge of operations for the public buildings in Washington, given before the House committee on appropriations, has brought out the fact that in the summer months, when it ceases to be necessary to condense water for heating purposes in the State, War and Navy Building, electrical energy for this big structure has been purchased from the Potomac Electric Power Company, which has been able to supply electricity more cheaply than the government can generate it in its plant.

Forty Years' Growth of New York Edison.—On Sept. 4 next the fortieth anniversary of New York City's original Pearl Street generating station is to be celebrated. On that date the first central station and underground distribution system were completed and placed in operation according to plans conceived and executed by Thomas A. Edison. One square mile of territory was served, though for lighting only, and the customers, fewer than sixty in number, had a total of 1,200 lamps on the circuit. Today, says the *Edison Monthly*, the Edison system in New York supplies 296,560 customers, energy is used for lighting 9,000,000 lamps, and in addition motors rated at 688,000 hp. are operated by the company's service.

Associations and Societies

A complete Directory of Electrical Associations is printed in the first issue of each month

Detroit Engineering Society.—John Mills of the Western Electric Company will speak on "The Human Voice and Its Electrical Transmission" before the Detroit Engineering Society on Friday, May 5.

New England Division, N. E. L. A.—The fourteenth annual convention of the New England Division of the National Electric Light Association will be held at the Hotel Griswold, New London, Conn., on Sept. 5, 6 and 7.

Washington Association of Building and Construction. — An organization under this name has been formed at Seattle to be composed of electrical contractors, architects, building contractors, bankers and, generally, all those identified with the building industry. Already 150 applications for membership have been received.

May Meetings of A. I. and S. E. E.—On Saturday, May 6, the Philadelphia Section of the Iron and Steel Association will hold a session devoted to "general ideas and discussion," every active member being invited to contribute a paper. On Monday, May 8, the Chicago Section will discuss "Heat Utilization" and the Cleveland District Section will listen to a paper by Dr. C. P. Steinmetz on static electricity.

Coming Meetings of Electrical and Other Technical Societies

Missouri Association of Public Utilities—Columbia, Mo., May 4-6.

A. I. and S. E. E. Section Meetings—Philadelphia, May 6; Chicago, May 8; Cleveland, May 8.

A. S. M. E. Spring Meeting—Atlanta, May 8-11. (For program see issue of April 15, page 750.)

Florida Engineering Society—Daytona, Fla., May 15-16.

N. E. L. A. Annual Convention—Atlantic City, May 15-19. (For program see issue of April 22, page 797.)

National Fire Protection Association—Atlantic City, N. J., May 15-19.

National Electrical Credit Association—Detroit, May 18-19.

Electrical Supply Jobbers' Association—Hot Springs, Va., May 24-26.

N. E. L. A. Geographic Divisions—Southwestern, San Antonio May 3-6; Pacific Coast, Los Angeles, May 31-June 3; Northwestern, Boise, June 7-10; North Central, St. Paul, June 13-15; Iowa Section, Lake Okoboji, June 20-22.

Electric Power Club—Hot Springs, Va., June 5-7.

Canadian Electrical Association—Ottawa, Ont., June 15-17.

Associated Manufacturers of Electrical Supplies—Spring Lake Beach, N. J., June 19-25.

American Physical Society, Pacific Coast Section—Salt Lake City, June 22-24.

A. I. E. E. Annual Convention—Niagara Falls, Ontario, June 26-30.

American Society for Testing Materials—Atlantic City, N. J., June 26-July 1.

Ohio Electric Light Association—Cedar Point, Ohio, July 11-14.

Recent Court Decisions

Findings of higher courts in legal cases involving electric light, power and other public utility companies

Law Governing Damages for Failure to Serve.—In Arnold vs. Alabama Power Company the plaintiff sought damages because of discontinuance of electric service, claiming that his advance deposit with the company covered the amount of the bill for failure to meet which the company disconnected him. The Supreme Court of Alabama held that the complaint did not allege facts to show that the plaintiff had performed the stipulated conditions precedent to service, which included the payment of accrued bills; that a mere averment of failure to receive three days' notice of discontinuance was insufficient, and that where a contract for electricity provided that a consumer should deposit a certain sum before connection of service, which could be applied by the power company upon any unpaid bill, the company was not required to apply the deposit in payment of a bill due and still continue to give service. (90 So. 909.)*

Supreme Court on "Going Concern" Value.—Finding against the contention that the fare fixed by the municipal board of Commissioners of Galveston, Tex., for the local street railway (Galveston Electric Company vs. City of Galveston) was confiscatory and therefore in violation of the Fourteenth Amendment of the United States Constitution, the Supreme Court of the United States thus discussed an item of $520,000 for "going concern" value allowed by a master and disallowed by the trial court: "If the rule were that a prescribed rate is to be held confiscatory in case net earnings are not sufficient to yield 8 per cent on the amount prudently invested in the business, there might be propriety in counting as part of the investment such amount, if any, as was necessarily expended at the start in overcoming initial difficulties incident to operation and in securing patronage. But no evidence of any such expenditure was introduced, and the claim of the company does not proceed upon that basis. What were presented by the witnesses are studies, on various theories, of what past deficiencies in net income would aggregate if 4 per cent were allowed as a depreciation annuity and 8 per cent compound interest were charged annually on the value of the property used. The fact that a utility may reach financial success only in time or not at all is a reason for allowing a liberal return on the money invested in the enterprise, but it does not make past losses an element to be considered in deciding what the base value is and whether the rate is confiscatory. A company which has failed to secure from year to year sufficient earnings to keep the investment unimpaired and to pay a fair return, whether its failure was the result of imprudence in engaging in the enterprise, or of errors in management, or of omission to exact proper prices for its output, cannot erect out of past deficits a legal basis for holding confiscatory for the future rates which would on the basis of present reproduction value otherwise be compensatory."

Negligence Established Where Absence of Guy Wire Allows Pole to Sag.—An electrician was injured by contact with a secondary wire of the Indianapolis Light & Heat Company which was accidentally carrying a high voltage because a primary wire of the Merchants' Heat & Light Company strung on poles 4 ft. or 5 ft. higher than those of the Indianapolis company had been permitted to sag until the wires of the two systems were in contact. The trial jury found the accident to be due to the fact that a pole was not properly guyed and (in Hoffmeyer vs. Merchants' Heat & Light Company) returned a verdict for the plaintiff. This finding has been sustained by the Appellate Court of Indiana, which overruled the defendant's contention that because the plaintiff had been permitted to amend his complaint so as to allege failure to have a guy on another pole than that originally designated an error had arisen, and also another contention concerning alleged error in the refusal of an instruction requested by defendant. (134 N. E. 485.)

High-Tension Wires with Worn Insulation 20 Ft. Above Street Constitute Neglect.—In Thornton Brothers Company vs. Northern States Power Company the plaintiff sought to recover a sum paid, under the workmen's compensation law, to a laborer who while endeavoring to lift sagging electric wires over the top of a rigid boom 17 ft. high was shocked and seriously hurt. It was shown that the wires, which crossed the street, were 20 ft. above the ground at the point of attachment. The insulation had become frayed and worn, and portions of the wire were exposed, and it was held that the accident was due to this fact. The Supreme Court of Minnesota sustained the trial court in finding for the plaintiff on the ground that the power company was negligent in suspending its wires so near the ground and then failing to maintain them in a safe condition. The question of contributory negligence was not involved, the court held, and the fact that the workman had lifted one wire safely over the boom was cited as throwing doubt on the contention that insulation on power wires affords no protection to those coming into contact with them and is consequently a negligible factor. (186 N. W. 863.)

*The left-hand number refers to the volume and the right-hand number to the page of the National Reporter System.

Commission Rulings

Important decisions of various state bodies involving or affecting electric light and power utilities

Rate Decrease of 5 per Cent Ordered for Potomac Company.—The Potomac Electric Power Company having professed inability to forecast its income in the ensuing year, the Public Utilities Commission of the District of Columbia made its own estimate, concluding that a discount of 5 per cent from the rates fixed on July 29, 1921, would be fair and reasonable and should apply to each schedule except the heating and cooking schedule, that for minimum customers under Schedule A and that relating to street and park lighting. This order cannot take effect until it is ratified by the court, but the commission says: "Even with the impounding of the larger amount required by the terms of this order the company will be enabled to pay all operating expenses and taxes, meet the interest on its bonded debt and enjoy a fair and reasonable return upon the value of its property as fixed by this commission to the same extent as it has enjoyed it in the past. The company will be protected by the final decision of the courts should it be determined that it is entitled to any part of the final amount impounded, and at the same time the public is equally protected in case of a decision adverse to the claim of the company."

Unremunerative Branch of Utility Must Not Be Recouped by Paying Branch.—The electric and gas departments of the Lynchburg Traction & Light Company having been found self-supporting while the street-railway department was barely earning a return on account of franchise restrictions, the question of recouping the losses of the unremunerative department from the returns of the other branches came up and was thus dealt with by the Virginia State Corporation Commission: "There seems to be no principle in the entire field of public regulation more clearly or more generally recognized than that each division or department of public service performed by a person or corporation operating more than one kind of public service must be self-supporting. Courts and commissions have with almost complete unanimity held that the patrons of, say, the electric department of a utility cannot be made to pay more than a fair rate in order to recoup the losses sustained in street-railway operation. It seems that only an emergency, to save temporarily the electric service in such an instance from failure to serve the public, could justify an increase in the electric rates if already yielding an adequate revenue."

Men of the Industry

Changes in Personnel—Responsibilities and Association Appointments of Men Engaged in Professional, Executive, Operating and Commercial Branches of the Industry

P. O. Reyneau has been appointed superintendent of the designing and estimating divisions of the transmission and distribution departments of the Philadelphia Electric Company. Mr. Reyneau comes to this position after sixteen years' experience in the operation of public utilities, particularly in the branch of distribution. He was graduated from Cornell University as a

P. O. REYNEAU

mechanical engineer in 1913. Prior to this, however, he had spent several years in electrical work, having been connected with the Telluride Power Company in Utah in 1906 and having spent four years in the West on various jobs connected with operating and constructing plants and transmission lines. Immediately after graduation he was employed in the overhead-lines department of the Detroit Edison Company. Later he was made distributing engineer and still later assistant electrical engineer of that company, holding the latter position until his resignation to become connected with the Philadelphia Electric Company. Mr. Reyneau is joint author with H. P. Seeley of "Economics of Electrical Distribution" and has contributed extensively to the technical press. He is a member of the national electrical engineering societies.

Prof. Lockwood N. Street of Syracuse University has recently resigned as consulting engineer for the Bureau of Gas and Electricity of Syracuse, N. Y.

Oscar M. Frykman, the new president of the Western Association of Electrical Inspectors, has been chief electrical inspector for the city of Minneapolis since 1912. Prior to becoming electrical inspector he had extensive experience in the telephone field and for four years was an electrical contractor in Minneapolis. Mr. Frykman is a mem- of the Minnesota State Board of Electricity and has served as instructor in electricity for the Young Men's Christian Association for three years.

Paul M. Downing, vice-president of the Pacific Gas & Electric Company, has been appointed chairman of the industrial committee of the San Francisco Chamber of Commerce.

Frank J. Beavers, former distribution engineer with the Gary (Ind.) Heat, Light & Water Company, Gary, is now with the engineering department of the Scranton (Pa.) Electric Company.

Philip G. Gossler has been elected president of the Columbia Gas & Electric Company, Charleston, W. Va., in addition to his many other executive duties. Mr. Gossler was born in Columbia, Pa., Aug. 6, 1870, and was graduated from the Penn State College as an electrical engineer in 1892, taking a post-graduate course at Columbia University in 1893. His first engineering work was with the engineering department of the Chester (Pa.) Foundry & Machine Company and the Edison General Electric Company. While at Columbia University and subsequent to graduation he was employed as assistant engineer in the United Electric Light & Power Company, New York, and in 1895 was appointed assistant engineer of the Royal Electric Company of Montreal, Canada. In 1901 he became connected with the Montreal Light, Heat & Power Company as general superintendent and manager, a position he held until 1904, when he became connected with J. G. White & Company as vice-president, holding this position until 1909. In 1909 he was elected chairman of the board of directors of the Columbia Gas & Electric Company, and in March of this year he was also elected president of that company. Mr. Gossler is also chairman of the board of directors of the Union Gas & Electric Company; president and director of the Helena Light & Railway Company, Long Acre Electric Light & Power Company, South Carolina Light, Power & Railway Company, Virginian Power Company, Dominion Power Company of Virginia, Dominion Power Company of West Virginia, New River Power Company and West Virginia Power Company; president of the Georgia Construction Company; vice-president and director of the United Fuel Gas Company, Cumberland County Power & Light Company, Macon Railway & Light Company, Central Georgia Power Company, Central Georgia Transmission Company, Macon Gas Company and Charleston Industrial Corporation; director of J. G. White & Company, Portland (Me.) Electric Company. Easton (Pa.) Railways Company, South Covington & Cincinnati Street Railways Company, Cincinnati, Newport & Covington Railway and Union Light, Heat & Power Company. Mr. Gossler is the author of various contributions to the technical press. He is a member of almost all of the national technical associations and of numerous local associations and clubs.

D. E. Parsons was elected president of the Illinois State Electric Association at its annual meeting, held during the latter part of March. Mr. Parsons is general manager of the East St. Louis Light & Power Company and is also a

D. E. PARSONS

past-president of the Illinois Electric Railways Association. He is a graduate of the mechanical engineering college of West Virginia University and of the two-year apprenticeship course of the Westinghouse Electric & Manufacturing Company. After serving in the sales department of the Westinghouse organization, Mr. Parsons was, in 1906, promoted to the position of head of the export division of the company's works. He was subsequently promoted to sales engineer in the railway, light and power department of the Pittsburgh district of the company. In 1916 he resigned to accept his present position.

Arthur L. Mullergren, consulting engineer, specializing in power plants and designs for public utilities, has opened offices at Kansas City, Mo., and New York City.

H. R. Stevens, formerly engaged as engineer in hydro-electric construction for the San Joaquin Light & Power Corporation, has recently sailed for Japan, where he will act as superintendent for Thebo, Starr & Anderton, San Francisco consulting engineers, on the hydro-electric plant they are building for the Daido Electric & Power Company at Nagaya.

Langdon Gibson, for twenty-three years manager of the production department of the Schenectady works of the General Electric Company, has recently resigned because of ill health and will retire from active business life. He is succeeded by H. L. R. Emmet, formerly assistant manager of the department. Mr. Gibson had been connected with the General Electric Company for twenty-seven years and was largely responsible for the growth and development of the department from very small beginnings. He has always been interested in Indian life and was a member of the first Peary expedition to the far North in 1891 and 1892.

LANGDON GIBSON

W. H. Campbell, for the past two years general sales manager of the Charleston Industrial Corporation, Nitro, W. Va., has opened offices at 30 Church Street, New York, under the firm name of W. H. Campbell, Inc., to handle the sale of new and used machinery.

Pierre E. Haynes, formerly gas and illumination expert for the city of Chicago and recently with the Union Carbon & Carbide Corporation, will be associated with Haynes & Mote, Hume-Mansur Building, Indianapolis, public utility counselors, as consulting engineer on utility valuations, plant operation, street illumination and other engineering problems.

Thomas H. Taylor, assistant general sales agent of the American Steel & Wire Company in charge of the Eastern district, with headquarters in New York for the last twenty-three years, retired from active service April 15. Mr. Taylor began business life as a hardware clerk at Creston, Iowa, in 1875. Subsequently he organized a retail store, which was the nucleus of the Omaha Hardware Company, a wholesale concern. A fire destroyed this establishment in 1891, and Mr. Taylor entered the wire industry as secretary of the Columbia Patent Company, which had been organized for the purpose of taking over patents claimed by the Washburn-Moen Company. Four years later he became sales manager of the Washburn-Moen Company and in 1898 was made manager of sales of the American Steel & Wire Company of Illinois, which had just been organized. The following year, when the American Steel & Wire Company of New Jersey was formed, Mr. Taylor became assistant general sales agent in charge of the Eastern district and held that position until his recent resignation. Mr. Taylor will spend the next few months traveling in Europe with his family and on his return will give his attention to the management of a feldspar manufacturing plant, an interest in which he holds.

Charles Franck, manager of the Holophane Glass Company, Inc., New York, has sailed for a three months' trip in Europe. He will tour Germany, Switzerland and France, spending most of the time visiting friends and former business associates. Mr. Franck was manager of the Holophane company's Brussels office for several years and left Belgium to become manager of the American company.

Frederick W. Prince, formerly advertising manager of the Westinghouse Electric & Manufacturing Company, is now filling a position on the staff of the publicity department of the Western Electric Company. Mr. Prince will be engaged in general sales promotion and publicity work.

S. H. Taylor has resigned from the presidency of the Electric Railway & Manufacturers' Supply Company, Westinghouse Electric & Manufacturing Company agent-jobbers in San Francisco, and will be succeeded by W. H. Whiteside, adviser to the Westinghouse company on the Pacific Coast.

H. L. R. Emmet, Langdon Gibson's successor as production manager of the Schenectady works of the General Electric Company, has been associated with the General Electric Company for ten years. He entered the employ of the company in November, 1912, as a clerk in the production department. In 1915 he was placed in charge of special production in connection with the execution of ammunition contracts during the world war and he was appointed assistant to the production manager on Jan. 1, 1917. Mr. Emmet is a nephew of W. L. R. Emmet, one of the consulting engineers of the company. He was born in New Rochelle in 1889 and is a graduate of Yale, class of 1912.

H. L. R. EMMET

Obituary

Elisha A. Tinker, member of the Public Utilities Commission of Ohio, died suddenly at his home in Columbus on March 21. Prior to his appointment to the commission in January, 1921, he was an attorney in Chillicothe.

Robert Brisbane, senior construction superintendent of the J. G. White Engineering Corporation, died on April 13 after an operation. He was born in Scotland in 1885 and came to this country when twenty-one years of age. He constructed a large number of public works and many private works. He had completed the rebuilding of the Bolinas (Cal.) station of the Radio Corporation of America and was about to take care of an undertaking in West Virginia when he was stricken with the illness that caused his death.

George R. Wales, sales agent at Boston for the Washburn Wire Company, Phillipsdale, R. I., died in Boston on April 14 from the effects of a recent operation. Mr. Wales had been identified with the steel and wire business all his life. Originally he was engaged with his father under the name of John Wales & Company, and about twenty years ago he started the National Wire Company at New Haven, Conn. This plant was later destroyed by fire. He then erected a new plant at Auburn, R. I., and this was taken over by the Washburn Wire Company some years later. When this deal was consummated Mr. Wales became associated with the Washburn company at Boston.

Hugh Trumbull of Plainville, Conn., died at Hartford, Conn., April 18, at the age of seventy-five years. Mr. Trumbull was connected with the Trumbull Electric Manufacturing Company, Plainville, until his retirement some years ago. He was the father of John H. Trumbull and Henry Trumbull, president and treasurer respectively of the Trumbull company; Alexander H. Trumbull, president of the Connecticut Electric Manufacturing Company, Bridgeport, Conn.; Frank S. Trumbull, secretary of the Connecticut Electric Manufacturing Company, and George Trumbull, Bantam, Conn. Besides his five sons, Mr. Trumbull is survived by his wife. He was born in Ireland and came to this country in his youth.

Trade and Market Conditions

Business Reviews, Together with Market Letters from Important Trade Centers, on the Supply, Demand and Prevailing Prices of Electrical Apparatus and Supplies

Minimum Prices Substituted for Heating Appliance Lists and Discounts

THE owners of the Marsh patent have made certain changes in Schedule B, which gave minimum list prices and maximum discounts, on heating appliances using the nickel-chromium alloy resistance wire. The changes become effective April 25. These changes consist of the abolishment of list prices and discounts formerly contained in Schedule B and the establishment of certain minimum prices for the various devices which are listed in the schedule. This enables each licensed manufacturer to establish his own list prices and discounts, and the only restriction with reference to prices placed upon the licensee by the owners of the Marsh patent is that the licensee shall not at any time sell the licensed appliances at prices lower than the minimum prices established by the schedule. In the schedule are listed both domestic and industrial types of heating devices.

The new minimum schedule prices are the same for all customers, with no differentiation between jobbers, central stations, contractors, department stores and other dealers.

The net prices are the same as under the old schedule except for flatirons, toasters and reflector-type heaters, which have been reduced slightly.

Inquiries for Steel Towers Increasing, with Orders Satisfactory

THE market for steel transmission towers has shown a new life since the first of the year, according to a statement to the ELECTRICAL WORLD by one of the manufacturers of this product, and the prospect is that there will be no let-up in orders for the rest of the summer. Central-station companies are in a good financial condition and very few of them are without plans for extending their transmission facilities. Much of this construction has been postponed for at least a year, and the result is that favorable quotations are now bringing it out into the open in quantity. Cheap money is another reason for going ahead with work now, a reason which was absent last year at this time.

The inquiries received are for work all over the country. The South is well represented and considerable work is going on in Kansas and other parts of the Middle West. St. Louis reports activity in Missouri and in the Southwest, while on the Pacific Coast several very large jobs have been proposed in recent months. Foreign demand is active also. A good-sized order has been received from the Dutch East Indies, and several central-station companies in Japan have also come into the market. European demand is not so marked as that of the Far East, but orders received from Europe have been fair.

Deliveries are good at the present time but are slowing up as the mills approach a normal working capacity. Manufacturers have not been carrying over-heavy stocks, and those they have are being worked off rapidly. The coal strike has not affected the supply of raw material so far, and little trouble is expected from that source inasmuch as the United States Steel Corporation has stated that its coal supply is sufficient to carry it through for several months. The strike, in fact, is fortunate for at least one manufacturer, who had $6,000,000 worth of coke on hand at the time the strike was called.

Prices have become more stabilized than formerly, partly as a result of the coal strike and partly because of better demand. Prices of general steel products have been going up for the past six weeks, and there is even a likelihood that quotations on transmission towers will show an upward trend in the near future.

Insulation Manufacturers Report Stronger Market and Better Buying

A BETTER demand for insulation materials and more stable prices are noted by manufacturers in this field, the pick-up having started early in February and having continued at an ever-increasing rate since that time. Bookings for March are estimated as double those of March, 1921, and April has bettered that record, it is thought, though exact figures have not been made available.

With higher prices ruling for cotton cloth and yarn, it is natural that insulation prices should show an upward trend. This has not resulted in increases, but rather in a stiffening of present prices. Better buying has been coming mainly from the repair and maintenance fields. Electric railways have shown considerable interest in comparison with the light buying from that direction in the first month of the year.

A very active market for mica insulation has been found in the radio business. Like every other industry connected with the radio-telephone business, mica insulation makers are working to capacity on this type of business and are behind in deliveries. Unfortunately few of these manufacturers can turn over all their machinery to making radio parts so that some departments are working below normal. The heating-appliance field is also taking a good amount of mica insulation, flatiron manufacturers being particularly active. Motor production is increasing, and as many of these concerns have been out of the market and have allowed their stocks to run down they are now ordering in good quantities. Starting and lighting systems for automobiles are also taking a great deal of mica insulation.

March Washing Machine Sales Increased 28 per Cent

SALES of washing machines for March, 1922, were greater than they had been during any month since August, 1920. According to Enoch B. Seitz, secretary American Washing Machine Manufacturers' Association, the March sales showed a gain of 28 per cent over the same period of 1921. The entire sales curve to date for 1922 is above that for the same period last year. A monthly improvement in this industry is also shown by the gain of 25 per cent in March sales over those of February, 1922. The March sales were better than the highest month in 1921—October—by 10 per cent. Figured on a dollar basis, March, 1922, showed an improvement of 18 per cent over the October business, because of the losses of liquidation. The total number of electric washing machines sold in 1921 was 289,406.

One of the reasons for this large and encouraging gain in business may be found in the fact that washing-machine manufacturers as a group have liquidated their prices to an extent that few others have. Price cuts taken over a

year or more have totaled between 35 and 40 per cent, and some concerns have gone even further than this in the effort to find the bottom. At last, apparently, the public is satisfied that no more price drops are coming and manufacturers again can start to sell on a basis of quality. Another reason for better business lies in the working off of jobbers' and dealers' stocks. Until the fall of 1921 washing machines moved very slowly and the outstanding stocks had been so little reduced that the manufacturers had no market. Sales became slightly better in the fall, and jobbers now are reordering and doing it more generously than at any time since the depression hit them.

Employment in the larger industrial centers in the East and Middle West has become better also, and a large part of the public which had been forced out of the market simply by lack of money is now in a position to buy. Dealers report that it requires twice the amount of salesmanship to sell appliances now that it did formerly, but this condition is common to all industries at the present time. The time-payment plan is very strongly to the fore, the larger percentage of sales being made on the basis of a small payment down and installments over a long period. This is particularly true in the West, where strong sales campaigns are being waged.

Department Stores Strongly in Radio Broadcasting Work

A REPORT prepared by the National Retail Dry Goods Association, analyzing radio-telephone conditions, shows seventy-one licensed radio broadcasting stations in the United States, of which seven are department stores, located as follows: Philadelphia, three; New York, one; Newark, one; St. Louis, one; Los Angeles, one. Scores of applications for licenses have been filed by other stores throughout the country, for, it is stated, they recognize radio as a merchandising opportunity of the first order with an estimated annual volume of $70,000,000. In many of the large stores sales of apparatus average $5,000 to $6,000 weekly in spite of the shortage of sets and parts. An important field is expected to be the rural general store, because radio telephony will bring metropolitan entertainments to country districts and assist in saving life and property in storm, flood or fire by sending out alarms.

Trade Optimistic Over Prospects for Successful Fan Season

REPORTS received from all sections of the country would seem to indicate that, given the usual amount of hot weather, the coming fan season will equal if not exceed that of last year. Not only are dealers beginning to come into the market in larger numbers than last year, but jobbers also have the courage of their convictions and early contracts have been more than satisfactory though a trifle slow in coming in. A certain large maker of fans has 28 per cent more orders booked, with four fewer contracts in, than was the case at this time last year and from now on will go into normal production. An officer of this company has pointed out to the ELECTRICAL WORLD, however, that the comparison of bookings for the two years is somewhat misleading as to exact conditions. Last year a heavy carry-over cut down the number of fans ordered on advance contracts, whereas this year there was a very small carry-over. Discounting this fact, it is expected that sales to consumers will about equal or go slightly ahead of last year. Retailers are beginning to feel out the market, and they report some good sales already to hospitals, stores, public buildings and various institutions.

The 12-in. oscillating fan is expected to be much in demand again this year, but the greatest increase in sales will probably be shown by the 8-in. package fan and the 9-in. oscillator. Both have been advertised widely as useful for traveling and other purposes for which a large fan cannot be used, and the public, it is thought, will take kindly to these fans this summer. The alternating-current ceiling fan is also expected to encounter a heavy demand.

In the East the fan business has been exceptionally good and orders continue to come through from dealers. In the Middle West stocks are all new, as the carry-over was very small. Retailers are not buying there very strongly as yet, but are expected to start within a few weeks. Atlanta reports that there has not been enough warm weather yet to cause any brisk retail movement, though jobbers declare retailers to be placing good orders. San Francisco stocks are not yet in, but are expected shortly, and jobbers are looking forward to a good season. Portland jobbers are not so fortunate as those of other sections, for cold weather last summer left them with a considerable carry-over. Stocks are all ready for this season, but the demand has not yet started.

Metal Market Situation

COPPER inquiry in the domestic market is fair in volume, and a moderate amount of metal is changing hands. Foreign buying is slightly better, but sales are still comparatively small. Greater optimism seems to prevail in regard to the Genoa conference and the results to be obtained from it. Uncertainty as to the degree in which the coal strike may affect general business before it is settled is restraining domestic buying. Utimate consumers see no reason why they should hurry to place orders with wire and brass mills when copper production is increasing.

Domestic inquiry is mainly for May and June, and some producers notice a tendency for the buying to be relatively better from larger than from smaller consumers. However, stocks in dealers' and jobbers' hands are undoubtedly below normal, so that there is a large latent demand that as yet remains unsatisfied. It is thought that both the tariff and the bonus are making many buyers more cautious than they would ordinarily be.

Prices are more spotty than they have been for some time, mainly on account of the uncertainty spoken of above. Some producers who have been naming 13 cents a pound as their price have dropped to 12¾ cents, and others who have been accepting business at 12¾ cents have gone up to 13 cents. These two prices seem to mark the limits of quotations, and there is no talk of any lots going cheaper than the 12¾ cents price.

That foreign and domestic buyers are following different policies has been noted. One large producer, commenting upon this, said that foreign users take American copper whenever they think the price is low, regardless of whether they will need the copper immediately or not. American users wait until they have orders for the fabricated copper in sight before they buy to cover. Accordingly they usually have to pay more for the metal. The largest foreign order going the rounds last week was for castings for shipment to China.

Reports from all steel centers indicate that demand is constantly growing. It is strong for virtually all lines, and were it not for the coal strike the industry as a whole would probably be operating at 80 per cent or higher.

NEW YORK METAL MARKET PRICES

Copper:	April 18, 1922	April 25, 1921
London, standard spot	£ s. d. 59 5 0	£ s. d. 59 0 0
	Cents per Pound	Cents per Pound
Prime Lake	12.87½	12.87½
Electrolytic	12.75	12.75
Casting	12.50	12.50
Wire base	14.00 –14.25	14.00 –14.25
Lead, Am. S. & R. price	5.00	5.25
Antimony	5.00	5.12½
Nickel, ingot	36.00	36.00
Sheet zinc, f.o.b. smelter	7.50	7.50
Zinc, spot	5.22½–5.27½	5.35 –5.40
Tin, straits	30.87½	31.12½
Aluminum, 98 to 99 per cent	19.10	19.10
OLD METALS		
Heavy copper and wire	10.75 –11.12½	1.00 –11.12½
Brass, heavy	5.25 – 5.62½	5.25 – 5.50
Brass, light	4.75 – 5.00	4.87½– 5.12½
Lead, heavy	4.00 – 4.25	4.25 – 4.37½
Zinc, old scrap	2.50 – 2.75	2.50 – 2.75

THE WEEK
IN TRADE

Prices When Quoted Are Those Prevailing at the Opening of Business on Monday of This Week for Points West of the Mississippi River and on Tuesday for All Eastern Points

TRADE in electrical circles pursued its leisurely way last week, and while there was no startling improvement to be noted, the activity of the first quarter is being maintained. In Chicago there has been a good movement of wiring materials, high-tension equipment, washing machines and vacuum cleaners. St. Louis bankers report financial conditions much better in the South and Southwest, and electrical jobbers are again selling in those territories. Bad weather hit Atlanta retail business once again last week, but industrial wiring is on the increase there. Boston trade is rather spotty, with prices steady. Interest in radio is growing rapidly in the Intermountain section and is far ahead of supply. Collections there show a gain of 7 to 10 per cent over this period last year. The San Francisco labor situation is quieter and a building strike will probably be avoided. The boom in lumber, together with good exports, seems destined to hurry prosperity back to the Northwest.

NEW YORK

Business conditions in the electrical trade continue to gain slowly but steadily. Jobbers do not report any unusually large sales, but the demand for wiring supplies holds up well and the general sentiment is that a very fair amount of business will be done during the spring and summer months. This is borne out by the development in building activity. Excavations for new buildings have been started in a number of locations in the commercial sections, and while many are far from being in the electrical stage of construction, this business will materialize during the summer and fall.

No price changes were reported this week, and prices generally seem to be more steady than they were a few weeks ago. Jobbers' stocks are in good condition, although there is no evidence of overstocks.

Rigid Conduit.—Jobbers have not been very rapid in advancing their quotations on conduit to cover the 7 per cent advance announced last week. The new prices will be as follows: For ½-in. black pipe in 2,500-ft. lots, $46.58; ¾-in., $59.57, and 1-in., $84.66 per 1,000 ft. Galvanized pipe in the same sizes and quantities will be quoted at $51.68, $66.47 and $94.88 per 1,000 ft. Most jobbers' stocks are in good shape

Rubber-Covered Wire.—Demand is very fair and jobbers' stocks are good. Prices are perhaps a little easier. No. 14 rubber-covered in 5,000-ft. lots sells for $6.25 to $6.35 per 1,000 ft. In 10,000-ft. lots it is understood that these quotations have been shaded slightly.

Flexible Armored Conductor.—Sales of this material hold up well and jobbers report a steady demand. Stocks are ample. Quotations on No. 14, two-wire, single-strip, range from $43 to $45 per 1,000 ft.. and double-strip from $45 to $47 for that quantity.

Porcelain.—A little better demand for porcelain for radio work has been noticed. No price changes have been announced.

Tape.—Both friction and rubber tape are quoted at 36 cents a pound in 100-lb. lots. A fair demand is reported.

Lamp Cord.—Sales are fair and jobbers' stocks are large. No. 18, cotton, twisted, sells from $11.65 to $12.75 per 1,000 ft. Parallel is quoted at $14.50 to $15.45 per 1,000 ft.

Fans.—Jobbers report about 20 per cent better sales than last year in spite of extremely cool weather for this time of year.

Metal Molding.—Movement of this material is fair and jobbers are carrying limited stocks. The three-wire size is quoted at $50 per 1,000 ft. for that quantity.

CHICAGO

With a continuing improvement in the electrical business, jobbers in general seem to feel that the burden of uncertainty of the past winter has been thrown off and that better business lies in the offing. Action on wiring materials is steadily increasing, and while prices are competitive, the building industry is constantly demanding these materials. High-tension manufacturers are unanimous in reporting a much improved interest in transmission equipment. Washing machines and vacuum cleaners are also moving well. One dealer reports sales for the month of March to be the best for some years. The interest in radio equipment is steadily increasing, but jobbers are operating under the handicap of small stocks.

Conduit.—A tendency toward a stiffening in price was noticed during the week. This action was undoubtedly taken in order to obtain a better return for handling this merchandise, since for the past few weeks jobbers have been forced to meet keen competition and accordingly have made little profit. The activity in the building industry has resulted in a steady movement of conduit. Jobbers' prices average around $42.50 per 1,000 ft. in 5,000-ft. lots. Stocks are ample.

Wire.—The demand for rubber-covered No. 14 wire is improving, jobbers reporting a good steady volume of business at prices around $6.25 per 1,000 ft. in 5,000-ft. lots. Quotations of some jobbers are still higher than this. Stocks are in good condition, but reorders are small. The call for weatherproof and bare wire is improving also owing to the building revival, but prices remain about on the same level as last reported.

Flexible Armored Conductor.—The previous active movement on armored conductor has been maintained and most jobbers sell the two-wire, single-strip, in lots of 5,000 ft. for $42 per 1,000 ft. Stocks are good but not excessive.

High-Tension Equipment.—Outdoor substations to be installed in the Middle West, rated at 33,000 volts, with a capacity of 600, 1,000 and 10,000 kva., were sold by one manufacturer. An order for 80,000-volt remote-controlled, pole-top switches was filled for a utility in Pennsylvania by another company.

Cleaners and Washers.—While strenuous efforts must still be made to sell these appliances, the good sales of the past three months have encouraged and compensated the dealers for this extra effort. Inquiries on vacuum cleaners are increasing and most dealers report a good business in this line. The demand for washing machines is steady, but sales are scattered.

Dry Cells.—The call for multiple-unit cells for radio use has increased steadily. In barrel lots the standard size is quoted at $30.52 per 100. This is a slight reduction due to a change in freight rates.

Appliances.—While the changing and unsettled weather for the past few weeks has somewhat aided the sale of open-air heaters, the market remains a bit sluggish. Flatirons seem to be the best line, but toasters, grills and percolators are also selling fairly well. Stocks are ample.

BOSTON

Trade is rather spotty this week, without much change in volume compared with last week. Conditions continue disturbed in the textile field owing to protracted strikes. Central-station earnings are improving, and considerable house wiring is keeping the contractors busy in not a few localities. Building and engineering contracts in New England for the week ended April 17 totaled $7,486,700, compared with $4,409,200 for the same week last year. Permits

to build in thirty-four cities and towns of Massachusetts issued during March gained 24 per cent over February, 1922, and 117 per cent over March, 1921. Prices in electrical supply lines reflect hardening tendencies in rigid conduit, with steady quotations in most items carried by jobbers except where sales are put through under sharp competition by heavily overstocked concerns.

Wire.—Increased building operations are calling upon wire stocks, but no shortage impends. Rubber-covered No. 14 moved Monday at $6.25 per 1,000 ft. in 5,000-ft. lots to $6.75 in smaller quantities. A little buying of weatherproof is being done, base price being 16½ cents. Deliveries are very easy. Bare copper wire in small sizes is in considerable demand for radio aërials.

Tape.—Small-order business prevails. Prices vary widely and purchases reflect considerable interest in the cheaper grades. Representative Boston figures are as follows: Less than 10 lb., "Amazon" tape, 50 cents per pound; "Competition" white tape, 80 cents; "Two-flex" tape, $1. In less than 25-lb. lots, "Victor" tape sells at 50 cents per pound; "Victor" splicing compound at 45 cents and "Sticka" tape at 45 cents.

Lamps.—Demand is off on mill-type lamps and sign lighting is dull. Street-lighting business is more active and sales of lamps for residential and mercantile use hold up well notwithstanding the advent of longer days. Prices are steady.

Rigid Conduit.—New sheets are soon to be issued detailing advances of 7 to 10 per cent over the last bulletins, business during the past week having been taken on the higher basis. Plenty of pipe and fittings are on hand, and shipments are only such as to replace the present moderate requirements.

Electric Vehicle Specialties.—A new schedule took effect Monday on certain electric truck fittings, the discounts to contractor-dealers reflecting easier prices. These are as follows, on typical items: Pipe caps, over $25 list 40 per cent, under $25 list 35 per cent; service caps, over $25 list 44 per cent, under $25 list 39 per cent; universals, over $50 list 27 per cent, under $50 list 22 per cent; weather caps, over $25 list 47 per cent, under $25 list 43 per cent.

Motors.—Spasmodic sales of small units feature an otherwise dull market. A good deal of betterment work in small manufacturing establishments is under way, and this leads to a fairly continuous movement of motors in the district as a whole. Competition is extremely acute, and not a little engineering analysis is being demanded in connection with bids.

ATLANTA

The short spell of good weather which permitted the resumption of agricultural activities was broken by several days of heavy rains, again slowing up the work throughout this section. Planting already delayed is going to be materially interfered with unless a long spell of good weather comes soon. A general survey of the territory indicates that farmers are putting in about one-half of the normal cotton crop and will work this intensively, diversifying crops on the rest of their land.

Retailers' stocks throughout the section have been allowed to become badly depleted, and purchases, as a result, are on the increase, though buying continues to be largely of the hand-to-mouth sort, with jobbers very careful in their extension of credit. The residential building boom continues unabated, the first quarter of 1922 having piled up permits in Atlanta alone to a valuation in excess of $4,000,000, with the general outlook that this pace will continue for some time to come. There is to be noted a considerable activity in municipal improvements, with central-station companies beginning activity to undertake expansions to plants. Industrial activity is on the increase, as indicated by the increased volume of orders received by the larger electrical contracting firms in the section.

Vacuum Cleaners.—A seasonal activity is reported, with sales showing up as fair to good. One of the largest dealers undertakes a brisk campaign on May 1, and it is expected that the movement will be improved considerably. Local stocks are in good shape.

Washing Machines.—This line continues dormant in spite of all efforts to revive it, sales at the present time being confined almost exclusively to the larger centers. Cheap labor is one of the principal factors in holding down the volume of sales. Local stocks are good to heavy.

Electric Churns.—The smaller centers are taking a fair volume, with some sales of the 32-volt type reported in the country districts. Local stocks are in fair condition with the retail price steady at $35.

Sewing Machines.—Sewing machines have not come up to their usual seasonal volume, sales now being the exception rather than the rule, with the larger centers reporting all the sales made. Stocks have been allowed to fall to a low ebb, and the retail price on the three-quarter-head vibrating type is $51.50. Price cutting is not uncommon.

Distributing Transformers.—The movement of the popular sizes is reported as quite satisfactory, the activity for line extensions and improvements to the smaller plants being largely responsible for this situation. Sizes in larger than 25 kw. are somewhat slow. Local stocks are in splendid shape.

Rigid Conduit.—An increase in price of 7 per cent is announced this week, applicable to both black and galvanized. The movement is quite satisfactory in all of the popular sizes with a noticeable increase in the number of orders for the larger sizes. Local stocks are in excellent shape.

Fans.—There has not been sufficient warm weather to cause any brisk retail movement as yet, though jobbers report retailers as placing satisfactory orders and the outlook is good for an excellent season. Jobbers' stocks are ample to meet the anticipated demand.

ST. LOUIS

Bankers returning from the various conventions in the South and Southwest declare that both banking conditions and general business conditions there show decided improvement. "Where a number of banks in Arkansas were hard up, they are now paid up," one reports, "and the banks are in good shape. There is an excellent outlook for crops and the prospect for fruit is said to be better than ever before." In Louisiana it is reported that the outlook for rice, sugar and cotton is especially good and that the banks have liquidated and are in good shape. This improvement in the South is naturally having its effect upon the business of St. Louis jobbers, and they all report substantial improvement in sales to that part of the territory.

Business in electrical lines showed no particular change last week. Movement in all lines is comparatively good, and while it is difficult to notice the change in comparing one week with the previous one, comparisons of month-to-month business reveal a continuance of that gradual and steady improvement which is marking the return to normal conditions in this locality. In the appliance lines flatirons, toasters and waffle irons are meeting with favored demand. Motors are moving much better than a year ago, and the increased building is aiding the sales of wiring materials. Carpenters are back at work pending arbitration of their wage scale.

Porcelain.—Demand and stocks continue on about the same average basis that has obtained for the past few months. "Nail-it" knobs are now priced at $15 per 1,000; two-wire and three-wire unglazed cleats at $10.70 per 1,000, 5½-in. split knobs at $10.70 per 1,000, ⅜-in. x 2½-in. tubes at $3.75 per 1,000, and ⅜-in. x 3-in. tubes at $4.50 per 1,000—all in barrel lots.

Loom.—Sales are becoming less spotty, and the amount being sold is reported to be from 10 per cent to 15 per

cent more than at this time last year. The 3/32-in. size is quoted at $14.80 per 1,000 ft. in 250-ft. coils and at $14.40 per 1,000 ft. in 1,000-ft. lots. The 1/4-in. size is quoted at $18.90 per 1,000 ft. in 250-ft. coils and at $17.55 per 1,000 ft. in 1,000-ft. lots.

Wire.—No. 14 rubber-covered continues to grow in demand and there is an active call for certain sizes of bare wire for radio purposes. Weatherproof shows some improvement, but extensive buying on the part of the power companies has not yet developed. No large stocks are to be found, for conservatism still rules. Rubber-covered solid, with single braid, in 5,000-ft. lots, is priced as follows: No. 14, $6 to $6.25 per 1,000 ft.; No. 12, $8.50 per 1,000 ft.; No. 10. $11.25 per 1,000 ft.; No. 8, $15.05 per 1,000 ft.

Portable Lamps.—A good indication of the better spending spirit on the part of the public is found in the sales of portables, as lamps of the higher grades are now selling in greater proportion than last year. A large retailer of lamps reports that business is materially better.

Flatirons.—The reduced prices have unquestionably strengthened the market, and the quantity being sold in this territory is reported to be at least 10 per cent better than at this time last year.

SAN FRANCISCO

The labor situation is quieter. Nearly all the crafts, including all the electrical unions, are working, and there are hopes that a general building strike may be averted. Contracting work is very good, with intensified competition. Nearly all the larger firms are working full crews. A great deal of municipal construction, such as schools, is reported, with more in sight. The spring is tapering off into summer, but some severe frosts have greatly harmed certain districts, such as the Santa Clara valley and San Leandro, and probably put others out of the running for the year as possibilities for much building or retail selling.

Fixtures.—This line has picked up considerably during the past month owing partly to numerous large jobs, but principally through the enormous increase in the building of private homes and small apartment houses. There still is a housing shortage, but "to let" signs are again noticeable even in the cities that until recently have been greatly cramped for room.

Fans.—Stocks are not yet in but are expected shortly. The country has been well covered and a good year is looked for.

Ranges.—No decision has yet been reached on the widespread demand that dealers and central-station companies should sell ranges at list prices, but their selling organizations are marking time in expectation of early action on this line.

Radio.—Absolute shortages of stock are reported on all sides in the face of a demand that is unprecedented. Late May deliveries are considered quick. Several local hotels are equipping their dining rooms with radio receiving apparatus, and at least one apartment house is furnishing such equipment with its apartments.

Washers.—The situation apparently is unchanged, but under the surface are plans for a revival of selling activities. Lack of this activity, which has been diverted in large measure to vacuum cleaners, is considered the real reason for the stagnant washer market.

Wire.—Special insulated wires, such as heater cord and stove wire, are in big demand by local manufacturers of waffle irons and radiators. As an index to the market, No. 16 reinforced heater cord is being quoted generally at about $37.50 per 1,000 ft. with a 5 per cent increase for 500-ft. quantities and a 10 per cent increase for coils. No. 14 single-braid solid rubber-covered wire is selling for about $6.50 per 1,000 ft. in 5,000-ft. lots. A brisk business is reported in expectation of an advance in the near future.

PORTLAND—SEATTLE

A continuation of the recent favorable weather, it is expected, will have a markedly stimulating effect on retail business and building operations. A very encouraging feature of the industrial situation in the Northwest is the continued acceleration of activity in lumber. Production for the week ended April 15 was only 4 per cent below normal, while new business was 22 per cent above production and shipments were only 11 per cent below new business. It is evident that production will have to increase materially if it is to keep pace with demands. This increasing demand for lumber is causing many of the mills to start night shifts, and several mills plan to put on night crews on May 1. Seattle's foreign trade for 1922 shows a substantial gain over the year before. This is true for a month to month comparison as well as for the first quarter of the year. A report just issued shows a gain of more than 20 per cent in imports for March of this year as compared with March, 1921. Export tonnage for the same period shows a material gain.

Electrical jobbers report business about the same, with a slight tendency toward improvement. Portland jobbers report that accounts for March were forty-one days outstanding as against forty-seven days for February. Credits are not loosening up to any extent. Small construction jobs are numerous enough to keep the contracting business fairly active. Great activity in Portland exists in public utility stock sales at this time.

Appliances.—Washing machines are fairly active, but ironers do not move very rapidly. Some reports show that vacuum-cleaner sales are high, but others find demand moderate.

Ranges.—The demand for electric ranges in Portland is exceptionally good, approximately a car load a month being installed within the city.

Air Heaters.—Demand for heaters is about over, and the stocks in general are very well cleaned up.

Fans.—Stocks of electric fans are all in. The demand has not started and probably will not for some little time. There is considerable carry-over in some stocks from last year, as last summer was a very poor season.

Fixtures.—Electrical dealers of Portland report fixtures very active but store sales quite slow.

SALT LAKE CITY—DENVER

The biggest construction job pending in the Intermountain region is the proposed Moffat tunnel piercing the Continental Divide about 35 miles west of Denver. The Colorado Legislature is now considering the proposition of issuing construction bonds in a sum not to exceed $6,720,000. The tunnel is to be wide enough for both a railway line and an automobile road. It will greatly facilitate traffic between Denver and Salt Lake City by shortening hauls and tapping rich agricultural and mining districts. Interest continues active in radio. The Salt Lake City Commercial Club has ordered the installation of an outfit for the benefit of its members. The report is current that the city is to have a large broadcasting station. Jobbers are overwhelmed with inquiries and orders from the retail electrical dealers, but as yet very little equipment has been received from the manufacturers.

Building activity is speeding up. This applies particularly to cottage construction but many large jobs are also getting under way. There has been a slight general advance in building materials. Collections show an improvement of 7 to 10 per cent over the corresponding month of last year.

Switchboards.—The activity in this line is showing a steady increase. Manufacturers are handling some large installations and using a bigger force of men than they have employed for months.

Conduit.—The demand is steady and stocks are ample. There has been a recent 7 per cent advance in price.

Sockets.—Prices are pretty well down, but the market shows a healthy tone.

Manufacturers' Activities

Devoted to the Business Side of Manufacturing, Distribution and Sales, News from Jobbers and Foreign Fields and a Record of New Devices and Trade Literature

Merger of Radio Manufacturing Companies Contemplated

Arrangements are being made to merge the Dubilier Condenser Company, the Federal Mica Company and the Cambridge Manufacturing Company into one corporation to be known as the Dubilier Condenser & Radio Company. All of these companies have been organized and are controlled by William Dubilier, who invented the Dubilier condenser now in use on most of the wireless instruments made. The new company will manufacture the radio condensers and also the larger condensers which are applied to big machinery. All classes of radio accessories will be manufactured also.

It is stated that the large demand for his condenser has rendered it necessary for Mr. Dubilier to enlarge his facilities, and he has entered into negotiations with bankers in order to provide the additional funds to accomplish this purpose. Capitalization of the new company will be $500,000.

Electric Furnace Company Now Issues House Organ

Publication of a new house organ, the *Electric Furnace News*, has been started by the Electric Furnace Company, Salem, Ohio. The publication is intended for distribution to industrials interested in the melting equipment manufactured by the company. The April issue contains articles on the results of the test of a resistance furnace by a British rolling mill, on tests of electric melting of glass and ferromanganese, and one on the new fields of usefulness for electric furnaces by T. F. Baily, vice-president of the company.

Dwight P. Robinson Reports Industrial Construction Active

The volume of industrial construction, which has been lagging behind during the last year, is now gradually increasing, according to Louis H. Bean, vice-president Dwight P. Robinson & Company.

Mr. Bean says: "An increasing demand for goods is gradually taking up the slack in available manufacturing space, and many industrial companies are now proceeding with new plants and extensions, as indicated by new contracts we received during the month of March. We have been authorized by the Denkmann Lumber Company to design and construct a complete electrically driven sawmill at Denco, Miss., together with a village of about fifty houses, schools, churches, etc., and additional work at the Denkmann plants at Canton and Pelahatachie, Miss., and also to design and construct a new sulphur-mining plant at Hoskins Mound, Tex., for the Freeport Sulphur Company. Additional purchases of American products were approved by the Brazilian government for our work on the great irrigation project now in progress in northeastern Brazil, the items including twelve locomotives."

Engineering Company Reorganizes

The announcement has been made that Webster L. Benham, under the firm name of the Benham Engineering Company, has taken over all the contracts of Benham & Mullergren, consulting engineers, Kansas City, Mo. The new company is established at 512 Gumbel Building, Kansas City, and will act in a consulting engineering capacity on electric light and power plants, waterworks and other construction projects. A. L. Mullergren retires from the firm, according to the statement issued, and will engage in private practice, specializing in electric light and power plant engineering and public utilities. His office will be at 555 Gates Building, Kansas City.

United Construction Company Optimistic

Edgar J. Ellis, president United Construction Company, 1727 Sansom Street, Philadelphia, gives a very optimistic view of the construction situation in that city. Mr. Ellis said to a representative of the ELECTRICAL WORLD: "Business in the building construction line has never been so good for the United Construction Company as it is today. We have been in electrical work for over twenty years and have never felt better satisfied. An extra large jump in work is expected shortly. The labor supply is good, and the men are satisfied with present wages but are anxious for more work."

New Yorkers Establish Lee Radio Corporation

The organization of the Lee Radio Corporation, Haddonfield, N. J., by New York interests has been announced. The company has obtained space in the factory of John E. Hand, nautical instrument makers. One hundred men are employed. Mauntwell Van Rensselaer of New York City is president of the company.

Order Sought to Sell Auto-Lite Factories

The Ohio Savings Bank & Trust Company has filed in the federal court at Toledo a motion for order of sale of the Auto-Lite Corporation's plants at Toledo and Fostoria, Ohio, in an effort to assist in payment of claims against the Willys Corporation, of which the Auto-Lite Corporation is a subsidiary. The total claims filed against the Willys Corporation, which is in the hands of a receiver, amount to $24,000,000, one-half of which will be admitted to be valid, a report accompanying the motion says. It is further stated that the Auto-Lite Corporation, whose business has been conducted separately from that of the Willys Corporation, has been and is doing a good business.

The report adds that all current obligations of the Auto-Lite Corporation will be taken over by the purchaser and that the proceeds of the sales of the properties will be distributed among the creditors of the Willys Corporation. Filed with the motion is an inventory of the Auto-Lite plants prepared by the receivers of the Willys Corporation, which shows that the Auto-Lite property is worth about $4,210,000.

Company Organized to Handle Used Machinery

Offices have been established at 30 Church Street, New York, by W. H. Campbell, Inc., an organization formed to sell both new and used power, refrigeration and chemical apparatus. The company is headed by W. H. Campbell, who for the past two years has been general sales manager of the Charleston Industrial Corporation, Nitro, W. Va. While with the Charleston Industrial Corporation, Mr. Campbell devoted his time to the sales of equipment from the former government munitions plant at Nitro.

Heine Boiler Company Sees Long Buyers' Market

In a message sent out to salesmen of the Heine Boiler Company, St. Louis, by C. R. D. Meier, president, it is stated that it may safely be assumed that it will be twenty years before the readjustment period is completely over and that in the meantime competition will be very strong and prices will not show much recovery. Mr. Meier takes as the basis of his statement a chart of wholesale prices from 1810 to 1920 prepared by the Russell Sage Foundation. In this period occurred the war of 1812, the Civil War and the World War, and the chart shows that prices declined steadily from 1812 to approximately 1835 and for an equally long period after the Civil War.

"Those who were in business as early as 1880," says Mr. Meier, "will recall that for a time prices were getting lower, business was scarce and competition very great. About 1898 conditions began to pick up and we

were steadily on an ascending wave until about 1914, when the increase was so marked as to be almost vertical on the chart. Now we are following exactly the same trend of conditions as was evidenced after the war of 1812 and the Civil War, the only difference being that the late conflict was of much greater magnitude and civilization today is much more complex than it was before. Consequently the readjustment period is going to be harder and perhaps longer."

The only means by which business can be kept afloat, Mr. Meier continues, is by sound financing, the establishment of a reputation for fair dealing and an honest product, low factory costs and intensive selling.

"I telegraphed you [the salesmen]," he says, giving an example of what intensive selling can do, "not long ago that we must have more business or the time would soon arrive when we must shut down our plants as our output was greatly exceeding the sales we were booking. What was the result? Within three days we booked orders that would take us two weeks to fill. Is it not perfectly evident that concentrated double-barreled work on sales-prospects is the only thing needed to put us over the hill?"

Pacific States Company Starts Intensive Wiring Campaign

An intensive campaign to acquaint the public better with the necessity for a complete job in the electrical wiring of homes, based on quality rather than on price, has been launched in southern California by the Pacific States Electric Company, Los Angeles, and more than 300 of its dealers. As more or less of a side issue, war will be made on the irresponsible contractor who provides an incomplete job at a cut-rate price, the number of these contractors having increased considerably in that section in the last year owing to employment conditions. The decision to wage these two campaigns was made recently at a meeting in Los Angeles of the heads of the Pacific States company and representatives of a large number of contractor-dealers in that territory.

The speakers at the meeting included David E. Harris, vice-president and general sales manager of the Pacific States company, who outlined briefly the salient points of the campaign, and J. D. Barnhill, president Evans & Barnhill, Inc., who is to have charge of the advertising and publicity of the campaign. A total of nineteen separate advertisements will appear thirty-eight times in the cities of Los Angeles, San Francisco, Portland and Seattle and nineteen times in Oakland, Fresno and Sacramento. These advertisements will attempt to sell house wiring to the public on the basis of good workmanship, standard materials and fair prices. The installation of sufficient convenience outlets in all wiring jobs will be an important object of the campaign.

Radio Industries Corporation Now in Production

The Radio Industries Corporation, 131 Duane Street, New York, has announced that it is in production of radio-telephone head sets and will be able to make deliveries beginning May 15. The company is manufacturing telephone head sets on which it has recent patents, and other patents are still pending. Benjamin Gould, formerly general sales manager of the Gould Appliance Company, which manufactured ironing machines, is vice-president and general sales manager for the Radio Industries Corporation and will have his headquarters at the Duane Street address.

Standard-Package Plan for Electric Truck Sales

An exceptional sales plan was begun this week by the Ward Motor Vehicle Company, Mount Vernon, N. Y., to stimulate electric road-truck sales. The company has just reduced the price of all models, the reduction ranging from 10 per cent to 35 per cent. In addition there is a special offer on the ½-ton and ¾-ton trucks, one model in each size, which might easily be called the standard-package plan, with the privilege of partial payments.

In these two sizes a truck, complete with chassis, body and Edison battery, is offered as a unit. This saves the customer from the confusion of having to decide on a battery and go elsewhere to pick out a body. A unit price is made, and in addition there are standard discounts for five and ten trucks. A partial-payment plan of $100 down, $495 on delivery and the balance in twenty-one equal monthly payments, is offered.

This standard-package plan is of more than passing interest because it is the first special merchandising attempt in the electric truck field made for some years. Besides, the co-operative plan of selling a special-type truck and one kind of battery is sufficiently unusual in itself to command attention.

Philadelphia Jobber Sees Prices Governing Present Business

Owing to the increased building construction work in Philadelphia, according to T. H. Lewis, president of the Elliot Lewis Supply Company, electrical jobber of that city, a larger demand for electrical goods is being experienced. A comparison of each month's business with that of the previous month shows a steady gain. New trade, coming from the occupants of the lately constructed houses, is resulting in a more active market for household appliances, such as vacuum cleaners, washers, electric flatirons and toasters. There is an increasing call for wireless apparatus, especially radio telephones.

Today, however, Mr. Lewis stated competition is very strong and it has narrowed down to a question of prices, the jobber who makes the lowest price usually getting the business.

"This company," Mr. Lewis continued, "adopted the policy when first starting in business of giving the public service. This policy was successful until two years ago, when business dropped suddenly. A conference was held and the decision to take the matter to the dealer was made. Here we found that the dealer was satisfied with our service, and we could not find what was the matter until it came to a question of prices. It was then found that the dealer could get goods at a lower price—he liked our service and our goods, but had to sell cheaper in order to get any business. We then took the question of prices up with the manufacturer and a reduction was made on both ends. This was accomplished through increased buying. Where we formerly brought a quarter of a million feet of wire, for instance, we today buy two million feet. The result has been a larger trade than ever, but the profit taken as a whole is not so large as formerly.

"Today, if sales to a particular customer drop, a conference is held, and if it is a question of prices, the matter is taken to the manufacturer and a meeting is arranged between the manufacturer, ourselves, as the jobber, and the dealer. The question of prices is then discussed, and we come to a satisfactory conclusion. Today, it is a question of prices and not service."

The Combustion Engineering Corporation, 43 Broad Street, New York, has arranged with the Power Plant Equipment Company, Kansas City, Mo., to act as its sales representative in eastern Kansas, eastern Nebraska, western Arkansas and western Missouri. Office will be at 1002 Coco-Cola Building.

The Federal Electric Company, Inc., with which is affiliated the Federal Sign System (Electric), has moved to the Bush Building, 130 West Forty-second Street, New York City, the change taking place on April 17.

The Vacu Signal Company, Haddonfield, N. J., has been organized to manufacture electric signals. John H. Lippincott, Jr., Mayor of Haddonfield, is president of the company.

The Roller-Smith Company, 233 Broadway, New York, has appointed Eshavick & Hoyle, Otis Building, Philadelphia, to handle its line of electrical instruments, meters and circuit breakers in that territory in place of the Perkins-Lenoir Company. The Perkins-Lenoir Company, which also represented the Roller-Smith Company in Baltimore, has been succeeded in the latter city by F. E. Perkins, 113 East Franklin Street.

The Driver-Harris Company, Harrison, N. J., manufacturer of electrical resistance wire and other products, on May 1 will move its Chicago office to larger quarters at 562-574 West Randolph Street. The old facilities, the company has announced, had become inadequate to handle the business of that territory.

Foreign Trade Notes

ELECTRICAL MACHINERY IMPORTED INTO SPAIN.—During the first ten months of 1921 the following material for the electrical industry, according to *Commerce Reports*, was imported into Spain: Generators, electromotors, induction coils, transformers and regulators up to 100 kw., 1,229,764 kw.; same from 100 kw. to 400 kw., 1,094,698 kw.; switchboards and interrupters up to 400 kw., 160,585 kw.; generators, electromotors, switchboards, etc., from 401 kw. to 2,500 kw., 2,590,484 kw.; same from 2,501 kw. to 5,000 kw., 455,271 kw.; same from 5,001 kw. upward, 930,729 kw., making a total of 6,461,531 kw. Of these quantities Germany sent 2,598,183 kw., Great Britain 770,313 kw., and the United States 1,428,210 kw., while imports from Switzerland totaled 384,106 kw.

JAPAN RAISES DUTY ON COPPER.—Japan has put into effect decided increases in the rates of duty applying to copper, according to cablegram advices to the Department of Commerce. The rate on copper ingots and slabs has been increased from 60 cents a picul (133 lb.) to $3.50 per picul. The increase on copper bars and rods is from $4.45 a picul to $7.50 a picul. The increase on copper plates and sheets is from $4.98 a picul to $8.00 a picul. The cablegram states that the action is necessary to protect Japan's domestic copper industry.

Foreign Trade Opportunities

Following are listed opportunities to enter foreign markets. Where the item is numbered further information can be obtained from the Bureau of Foreign and Domestic Commerce, Washington, by mentioning the number.

An inquiry has been received from Mexico (No. 1,356) for a wireless telephone with two receiving and two transmitting telephones, with a radius of 5 miles, to be used in connection with a street-car system.

There is a market in Italy (No. 1,377) for electrical machinery, apparatus, etc.

TELEGRAPH AND TELEPHONE MATERIAL FOR BANGKOK, ASIA.—Tenders will be received by the Department of Posts and Telegraphs, Bangkok, until June 5, according to the *Electrician*, for telegraph and telephone material, to cost about £10,000. Tender forms may be obtained from the chief electrical engineer, Telephone Exchange, Bangkok.

New Apparatus and Publications

TRANSFORMERS.—The Moloney Electric Company, St. Louis, has issued catalog No. 215, covering its various types of transformers, including dimensions, price lists, etc. Catalog No. 217 issued by the company contains information in regard to the care and use of transformers.

RECORDING EQUIPMENT.—The Uehling Instrument Company, Paterson, N. J., is distributing bulletin 112, covering Uehling CO_2 recording equipment. Particular attention is called to the recently developed "Pyro-porus" filter, and also to the separate recorder for the engineer's office and indicator for boiler-front continuous (not intermittent) chart record and dry method of absorption.

RESISTANCE-MEASURING INSTRUMENT.—Herman H. Sticht & Company, 15 Park Row, New York City, is distributing leaflet No. 15, describing its model "D" and "2 in 1" megohmers for measuring and testing voltages.

INDUSTRIAL TRUCKS.—The Eleveyor Electric Industrial Truck Company, 56 Huntington Street, Brooklyn, is distributing two leaflets covering "Eleveyor" electric industrial truck with loading platform.

WATER HEATER.—The Electric Heating & Manufacturing Company, Westlake and Republican Streets, Seattle, is distributing a circular describing the Apfel "Coppergert" electric water heater, recently developed by the company.

WASHING MACHINE.—The Maytag Company, Newton, Iowa, has placed on the market an electric washing machine with a tub of cast aluminum.

AUTOMOBILE SIGNAL.—An all-electric directional traffic indicator, "Hankee," operated by an electric motor, has been placed on the market by the Naser Electric Company, Minneapolis.

UTILITY APPLIANCE.—The Sieben Manufacturing Company, Kansas City, Mo., has issued a four-page circular describing its "All-in-One" electrical unit, consisting of a fan, heater, toaster, clothes drier, grill, hair drier and hot-plate range.

COPPER TUBING.—The Chase Metal Works, Waterbury, Conn., are distributing a six-page leaflet covering their seamless brass and copper tubing.

PULVERIZING MILL.—The Hardinge Company, 120 Broadway, New York City, has issued a bulletin covering the Hardinge conical mill, in which is shown the adaptability of the mill to industrial and metallurgical grinding problems, etc.

CLOTHES WASHER WITH CHURN.—The Wayne Manufacturing Company, 124 Sidney Street, St. Louis, has added a new feature to the "Wayne" Electric clothes washer, consisting of "Baby" washer and churn.

New Companies

THE SMITH-SANDERS POWER COMPANY, Rogersville, Tenn., has been incorporated with a capital stock of $50,000 by Charles M. Smith, John R. and X. T. Sanders.

THE PAGE POWER COMPANY, Richmond, Va., has been incorporated with a capital stock of $300,000 to distribute electricity in Page and adjoining counties. The officers are: M. E. Roundabush, Stanley, president, and A. A. Roundabush, Shenandoah, secretary.

THE GRAND ISLAND (N. Y.) LIGHT & POWER CORPORATION has been chartered with a capital stock of $50,000 by F. J. Offerman and J. Schutt, Jr.

THE FARMINGTON LIGHT & POWER COMPANY, West Farmington, Ohio, has been incorporated with a capital stock of $5,000 by J. H. Elwell, Orris Newcomb, F. S. Hart, C. E. Stevens and H. G. Chapel.

Record of Electrical Patents

Notes on United States Patents

(Issued April 4, 1922)

1,411,586. SYSTEM OF MOTOR CONTROL; Harold W. Rogers, Schenectady, N. Y. App. filed May 21, 1920. One of the Ward-Leonard resistance type.

1,411,613 to 1,411,616. FLASHLIGHT; Fred Evans, Summit, N. J. Applications filed March 22, 1920. Four types of flashlamps with self-contained generator operated by hand.

1,411,619. ELECTRICAL APPARATUS; John J. Frank, Pittsfield, Mass. App. filed Dec. 10, 1919. Coil form and support for transformers, reactors, etc.

1,411,620. ELECTRIC SWITCH; John H. Groegr, Bridgeport, Conn. App. filed Dec. 6, 1917. For automobile headlight having a separate dimming bulb.

1,411,643. INSTRUMENT FOR GENERATING ELECTRIC CURRENTS FOR IGNITION STARTING AND LIGHTING; Kurt F. Ries, Dayton, Ohio. App. filed April 8, 1920. Magneto, generator, distributer, dual circuit breaker and condenser in one unit.

1,411,657. CIRCULATION FOR ELECTRODEPOSIT SYSTEMS; Charles Duncan, Philadelphia, Pa. App. filed Dec. 11, 1920. Propeller to keep electrolyte in circulation.

1,411,663. ELECTRICAL HEATING APPLIANCE; Robert Kemp, Elmhurst, N. Y. App. filed Feb. 26, 1921. Used with portable fans.

1,411,700. MOTOR CONTROLLER; William T. Holmes, Baltimore, Md. App. filed Feb. 8, 1918. For dynamic braking on direct-current motors.

1,411,712. TIME-CONTROLLED MOTOR; Frederick Diehl, Elizabeth, N. J. App. filed July 26, 1916. Device for stopping fan motors after a definite period.

1,411,716. ELECTRIC LIGHT BULB; Andrew A. Flory, Grand Rapids, Mich. App. filed May 10, 1918. Automobile bulb with two filaments for dimming.

1,411,754. HEADLIGHT REGULATOR; Edgar M. Soreng, Milwaukee, Wis. App. filed Nov. 24, 1916. For lights supplied from magneto.

1,411,814. POWER SYSTEM FOR RADIO APPARATUS; Hugh M. Stoller, New York, N. Y. App. filed April 30, 1918. Transmitting tube set for aëroplanes.

1,411,849. TROLLEY POLE FOR TRACKLESS TROLLEY CARS; Edward L. Kraft, York, Pa. App. filed June 8, 1921.

1,411,862. CONTROLLING AND REGULATING APPARATUS FOR ALTERNATING-CURRENT DYNAMO-ELECTRIC MACHINES; Friedrich W. Meyer, Milwaukee, Wis. App. filed Jan. 21, 1918. Stable operation by using electro-ionic valves.

1,411,893. TROLLEY SHOE; John L. Whittaker, Winthrop, Mass. App. filed May 2, 1918. Sliding shoe.

1,411,901. RHEOSTAT; Edward M. Bentley, Lawrence, N. Y. App. filed July 17, 1919. Formed of a ribbon folded into a series of loops.

1,411,947. ELECTRIC SOCKET DEVICE FOR VEHICLE LAMPS; Frederick G. Whittington, Chicago, Ill. App. filed June 23, 1920. Switch and socket arrangement for spotlamp.

1,411,987. SHIP-PROPULSION SYSTEM; Frederic H. Clough, Rugby, England. App. filed Jan. 28, 1921. By synchronous motor with dynamic braking.

1,411,988. TERMINAL STRUCTURE FOR ELECTRIC BATTERIES; Thomas R. Cook, Pittsburgh, Pa. App. filed Feb. 18, 1920. To prevent leakage in storage battery by wedged bushing.

1,411,989. TERMINAL STRUCTURE FOR ELECTRIC BATTERIES; Thomas R. Cook and Paul E. Norris, Pittsburgh, Pa. App. filed March 10, 1920. To prevent leakage.

1,411,998. TROLLEY HEAD; Edwin B. Grace and William J. Laffey, Memphis, Tenn. App. filed July 16, 1921. Collector for three-wire system.

(Issued April 11, 1922)

1,412,051. ARMATURE TESTER; Percy A. Gaalaas, Minneapolis, Minn. App. filed Sept. 20, 1920. For short circuits, open circuits and grounds.

1,412,067. VOICE-CURRENT TELEPHONE REPEATER; Arthur B. Smith, Evanston, Ill. App. filed June 6, 1918. In either direction, over long-distance trunk line.

1,412,079. CABLE CONNECTION FOR BRUSHES; Victor C. Hamister, Cleveland, Ohio. App. filed June 2, 1919. Pigtail soldered in way to prevent solder running out when overheated.

1,412,080. TELEPHONE TRANSMITTER; Alexander E. Keith, Hinsdale, Ill. App. filed April 14, 1917. For reducing "packing" effect.

1,412,094. AUTOMATIC TELEPHONE SYSTEM; Arthur B. Smith, Evanston, Ill. App. filed Oct. 8, 1921. Trunking system.

1,412,103. SERVICE-OBSERVING SET; George Crisson, Hackensack, N. J. App. filed Nov. 24, 1920. For determining service on telephone lines.

1,412,112. DIRECTION SIGNALING APPARATUS FOR MOTOR VEHICLES; Carl Claussen Heise, Decatur, Ill. App. filed Aug. 18, 1920.

1,412,174. ART OF MAKING ELECTROLYTIC IRON; Frederic A. Eustis, Milton, Mass. App. filed Dec. 1, 1920. Means for preventing ferric iron from acting on cathode.

1,412,228. AUTOMATIC STARTING AND SHORT-CIRCUITING DEVICE FOR ASYNCHRONOUS MOTORS; J. U. F. Andersen and A. F. B. Iversen, Copenhagen, Denmark. App. filed Dec. 6, 1918. Mercury while held in position by centrifugal force short-circuits starting coils.

1,412,252. MACHINE GUN AND SIMILAR WEAPON; Helmuth P. Martin and Owen D. Lucas, Westminster, London, England. App. filed Sept. 15, 1920. For timing the firing of electrically detonated ammunition.

1,412,269. RAIL BOND AND METHOD OF MAKING SAME; Charles A. Cadwell, Cleveland, Ohio. App. filed June 23, 1919. For putting terminal onto wire.

1,412,271. MEANS FOR CONTROL OF ENGINES OR APPARATUS; Leon J. Creplet, Paris, France. App. filed Feb. 14, 1919. Operates from distance engines having limited movements.

1,412,272. ELECTRIC REGULATION; John L. Creveling, White Plains, N. Y. App. filed Oct. 7, 1916. For regulating either current or voltage.

1,412,273. ELECTRIC REGULATION; John L. Creveling, White Plains, N. Y. App. filed Aug. 17, 1916. For variable-speed generators.

1,412,274. ELECTRIC REGULATION; John L. Creveling, White Plains, N. Y. App. filed Aug. 17, 1916. Maintains constant voltage on variable-speed generator.

1,412,339. ELECTRIC REGULATION; John L. Creveling, New York, N. Y. App. filed March 8, 1912. Automobile generator regulator for charging battery.

1,412,372. ELECTRICAL SWITCHING DEVICE; William H. Sharpe, Lakewood, Ohio. App. filed May 5, 1920. Plunger type for automatic telephone systems.

Construction News

Projects, Plans, Bids and Contracts, Contemplated or Under Way

New England States

PRINCETON, ME.—The Electric Light Department is considering building a new power station for the municipal electric plant and installing new equipment. W. W. Kneeland is chairman of the commission.

PROVIDENCE, R. I.—The Narragansett Electric Light Company has awarded a contract to the Fred T. Ley Company, Springfield, Mass., for the erection of a two-story power house and service works, totaling eight buildings, on Melrose Street.

LITCHFIELD, CONN.—The Washington Electric Light & Power Company expects to extend its system to New Preston Village and New Preston Station. E. L. Miner is superintendent.

NORWICH, CONN.—The Eastern Connecticut Power Company has increased its capital from $1,500,000 to $4,000,000, part of the proceeds to be used for extensions and improvements.

WATERBURY, CONN.—The Connecticut Light & Power Company has completed plans for the construction of a service building, on Freight Street, to cost $80,000. Louis A. Walsh, 51 Leavenworth Street, is architect.

Middle Atlantic States

BINGHAMTON, N. Y.—The Binghamton Light, Heat & Power Company contemplates extending its transmission lines to Nimmonsburg and Chenango Forks, with local distributing systems. A distributing system will also be installed at Vestal.

BROOKLYN, N. Y.—The Brooklyn Edison Company is taking bids for the erection of a power plant at the foot of Sixty-sixth Street, to cost about $1,000,000 with equipment.

BUFFALO, N. Y.—Bids will be received by the Department of Hospitals and Dispensaries until May 8 for work in connection with the new hospital at 642 Grider Street, including auxiliary lighting system, lighting fixtures, refrigerating and ice machinery (electrically operated), conduit and wire. George S. Staniland, M.D., is secretary.

DANSVILLE, N. Y.—The Dansville Gas & Electric Company is rewiring the village for changing the system to three-phase, 60 cycles, 110/220 volts, 2,200 volts primary. Electricity will be purchased from a hydro-electric company, which is erecting a dam and power house between 2 and 3 miles from Dansville. Power will be delivered at 2,300 volts. When the change is made the company will furnish service outside of the village. C. H. Mason is superintendent.

GOWANDA, N. Y.—The Iroquois Utilities, Inc., contemplates the installation of additional waterwheels with a total capacity of 980 hp., General Electric generators of 600 kva. and the erection of 12 miles of 60,000-volt transmission lines. J. W. Grace is manager.

LOCKPORT, N. Y.—The Lockport Light, Heat & Power Company contemplates the erection of new rural transmission lines and the installation of a 1,500-hp. waterwheel to replace a 500-hp. wheel. John A. Duff is assistant secretary and treasurer.

NEW YORK, N. Y.—Bids will be received by the Treasury Department, office of the Supervising Architect, until May 8 for mechanical equipment for an addition to the boiler plant and transformer substation at the Quarantine Station, Hoffman Island.

NEW YORK, N. Y.—The Manila (P. I.) Electric Company, operated by the J. G. White Management Corporation, 43 Exchange Place, has issued $2,500,000 in bonds, part of the proceeds to be used for extensions and improvements.

PLATTSBURG, N. Y.—The Plattsburg Gas & Electric Company contemplates extending its transmission line from Cadyville to Lyon Mountain to furnish electricity to the iron mines at the latter place. H. A. Stutchbury is superintendent.

PORT HENRY, N. Y.—The Port Henry Light, Heat & Power Company contemplates the installation of an additional 1,500-hp. waterwheel. C. F. Carpenter is superintendent.

RETSOF, N. Y.—The Retsof Mining Company will build a power house in connection with its new salt-mining and refining plant, to cost about $700,000. T. F. Courthope is engineer.

SARANAC LAKE, N. Y.—The Paul Smith's Electric Light, Power & Railroad Company contemplates the erection of rural lines and extensions in villages, to cost about $10,000. P. A. Gould, Saranac Lake, is manager.

FRENCHTOWN, N. J.—The installation of an entire new generating unit of about 100 kw. capacity in the municipal electric light plant is under consideration. Russell W. Bloom is clerk.

CHAMBERSBURG, PA.—The Council will soon take bids for the erection of a new municipal power plant on Third Street, to cost about $150,000 with machinery. Albert C. Wood, Stock Exchange Building, Philadelphia, is engineer.

DALLAS, PA.—A power house will be erected at the new convent to be erected for the Sisters of Mercy, to cost about $400,000. Charles L. Morris, Coal Exchange Building, is head of the building commission.

GROVE CITY, PA.—New equipment, including a 185-hp. Bessemer oil engine directly connected to a 125-kw., three-phase General Electric generator, and one 35-kw. General Electric motor-generator exciter set will be installed in the municipal electric plant; both sets to be in operation by August 1. Frank H. Poehlman is superintendent.

HARRISBURG, PA.—Bids will be received by T. W. Templeton, Superintendent of Public Grounds and Buildings, until May 9 for power-plant supplies, etc., for the coming year.

HARRISBURG, PA.—Athenas George, 1601 Eleventh Avenue, Altoona, Pa., is organizing a company to construct and operate a power plant on Independence Island, Susquehanna River. Walter Frieling, 1312 Fourteenth Avenue, Altoona, is architect and engineer.

HELLERTOWN, PA.—The Pennsylvania Power & Light Company will extend its transmission line to Bingen, Saucona and Springtown.

HOLLAND, PA.—The Pennsylvania Edison Company, Easton, Pa., has acquired the Lippincott property, on which it proposes to erect a new hydro-electric plant.

ORRTANNA, PA.—The Orrtanna Electric Light & Power Company is building a new power station about a mile from the present location. The equipment will include a waterwheel, which is being installed, and a steam engine and boiler, which have not yet been purchased. S. Z. Musselman is secretary.

PARRYVILLE, PA.—The Lehighton Electric Lighting Company, Lehighton, will build a transmission line to Parryville, to furnish electric service. James I. Blakslee is president.

PHILADELPHIA, PA.—The Philadelphia Suburban Gas & Electric Company has issued $2,000,000 in bonds, part of the proceeds to be used for extensions and improvements.

PHILADELPHIA, PA.—Bids will be received by the Bureau of Supplies and Accounts, Navy Department, Washington, D. C., until May 2 for motors, control panels and spare parts for the local navy yard (Schedule 9598).

READING, PA.—The Metropolitan Edison Company is considering the installation of a new generator in the Reading plant and may erect a transmission line to Easton.

STAUFFERSTOWN, PA.—The Stauffers-town Electric Company has applied to the Public Service Commission for permission to operate in Franklin County.

BALTIMORE, MD.—A power house will be erected at the new hospital group near Montebello Park, to cost $750,000. Edward H. Glidden, American Building, is architect.

HAGERSTOWN, MD.—The Hagerstown & Frederick Railway Company has changed its name to the Potomac Public Service Company. Permission has been received from the Public Service Commission to issue bonds for $2,155,000, part of the proceeds to be used for extensions and betterments in its electric system.

CLARKSBURG, W. VA.—The Council has authorized plans for the installation of an ornamental lighting system in the business district.

ROMNEY, W. VA.—The Romney Electric Company contemplates the construction of a 50-kw. hydro-electric plant to supplement the present plant. J. S. O'Hara is manager.

DAMASCUS, VA.—The Damascus Light & Power Company is considering the construction of a new generating station. B. W. Mock is secretary and treasurer.

LYNCHBURG, VA.—The Lynchburg Traction & Light Company has filed plans for an addition to its local power plant.

WASHINGTON, D. C.—The Bureau of Yards and Docks, Navy Department, has specifications under way for the following equipment and will call for bids in the near future: Turbo-alternator for Pearl Harbor (Specification 4548); reciprocating air compressor, New York (Specification 4555); alternators and auxiliary electric equipment, Yorktown, Va. (Specification 4612); reciprocating air compressor, Bellevue, D. C. (Specification 4622).

WASHINGTON, D. C.—The Potomac Electric Power Company contemplates the replacement of a 9,000-kva., 25-cycle, 6,600-volt, three-phase turbine with a 12,500-kva., 60-cycle, three-phase, 13,200-volt turbine; installing 12,000 kva. capacity in step-down transformers, 13,200 and 2,400 volts, one high-tension heater, and changing three railroad substations to automatic substations. A. G. Neal is comptroller.

North Central States

BAY CITY, MICH.—The Council will soon call for bids for the construction of a power house and electric pumping plant for the waterworks system, to cost about $85,000. The Frazier-Sheal Company, Illuminating Building, Cleveland, is engineer.

ESSEXVILLE, MICH.—The Aetna Portland Cement Company, 412 Union Trust Building, Detroit, will build a one-story power plant in connection with its new cement works, to cost about $1,000,000. Oscar J. Lingeman is general manager.

LANSING, MICH.—A special election will be held on May 8 to vote on the proposal to issue $800,000 in bonds for extensions to the municipal electric light and power system.

SAGINAW, MICH.—The Riverside Coal Company plans to rebuild the power house at its Riverside mine, recently destroyed by fire, causing a loss of about $35,000.

STANTON, MICH.—Extensive improvements are contemplated to the municipal electric light plant, including rebuilding the distribution system, changing engine and generator and establishing a twenty-four-hour service, etc. Harry Slater is superintendent.

FORT COVINGTON, KY.—The Fort Covington Light, Heat & Power Company is considering the construction of a new power station. W. H. S. Keefe is manager.

COLUMBUS, IND.—The Board of Public Works is considering rebuilding the municipal street-lighting system. C. A. Reeves is president of board.

FILLMORE, IND.—Earl Padgett, owner of the Fillmore and Whitestown light and power system, contemplates the erection of 3½ miles of 2,200-volt transmission line to serve a small village and also farmers along the line.

VERNON, IND.—The Vernon Hydro-Electric Company contemplates extending its lines to make connections with two other corporations and to install a new Diesel engine. The company may discontinue the local generating plant and erect about 20 miles of high-tension lines. George C. Ale is president.

CHICAGO, ILL.—The Illinois Central Railroad Company, 135 East Eleventh Place, is preparing plans for the electrification of its local terminal and city lines, to cost about $10,000,000. Plans are being prepared and work will begin in July.

EVANSTON, ILL.—The Public Service Company of Northern Illinois will build a 12,000-volt transmission line from Evanston to Des Plaines. A transmission line will also be erected from Blue Island to Chicago Heights.

LOWELL, WIS.—The Lowell Light & Power Company will erect an extension to its rural line, 3 miles long, in May. W. F. Pease, Jr., is secretary.

PESHTIGO, WIS.—The Oconto (Wis.) Service Company will build an addition to its local power house and install a 500-hp. vertical waterwheel and generator. A. T. Pamperin, Oconto, is treasurer.

BEMIDJI, MINN.—The Minnesota Electric Light & Power Company is planning extensions to its plant and system, to cost about $4,000. Elmer E. Swanson is manager.

CLARKFIELD, MINN.—The Clarkfield Roller Mills, Inc., will discontinue producing electricity after May 7, as the village has voted bonds to erect a transmission

line and purchase electricity from the Northern States Power Company and distribute it in Clarkfield.

MINNEAPOLIS, MINN.—The Northern States Power Company contemplates the erection of new hydro-electric power plants on the Mississippi and St. Croix Rivers. Application has been made to the Federal Power Commission for permission.

STARBUCK, MINN.—Plans are being considered to change the lighting circuits of the municipal lighting system from 220 volts to 110 volts. A. H. Dreyer is manager.

BOONE, IOWA—A special election has been called to vote on the proposal to issue $250,000 in bonds for the construction of a municipal power plant on the Des Moines River. Burns & McDonnell, Interstate Building, Kansas City, Mo., are engineers.

LOVILIA, IOWA.—The Lovilia Light & Power Company contemplates extending its transmission line from Bussey to Hamilton.

JOPLIN, MO. — The Ozark Power & Water Company has issued $2,000,000 in bonds, part of the proceeds to be used for extensions and improvements to its system.

ST. JOSEPH, MO.—The St. Joseph Transmission Company contemplates the erection of 40 miles of three-phase, 22,000-volt transmission line. Morton R. Martin, Oregon, is manager.

SILEX, MO.—The Silex Electric Light Company will install an additional engine and generator, to double the capacity of its plant, and also extend its lines into the farming section near the town. James Lindsay is manager.

NEW LEIPZIG, N. D.—The New Leipzig Electric Company will change the motive power of its plant from oil to steam and will install a 100-hp. engine and two 110-hp. boilers, fire-box type. Line extensions call for 7,000 lb. No. 4/0 wire. Henry Lewis is owner and manager.

BEATRICE, NEB. — J. H. Krug, Beatrice, who operates the transmission system, which supplies electricity in the towns of Herkimer, Kan., Lanham, Odell, Diller and Steele City, Neb., expects to three-phase about 20 miles of 13,200-volt transmission line.

BROKEN BOW, NEB. — The Martin Brothers Electric & Ice Company expects to supply electricity to the village of Merna within the next two months. C. A. Martin is manager.

DESHLER, NEB.—The Deshler Light & Power Company contemplates the erection of a transmission line to Bryon and Hardy to supply electrical service in both towns. C. V. Stewart is manager.

MERNA, NEB. — The Council contemplates erecting a 6,600-volt transmission line from Merna to Broken Bow, where it will secure electricity to operate the municipal electric lighting system. The local system will be changed from direct to alternating current. W. O. Webster is superintendent.

WAHOO, NEB.—The installation of a new 300-kw. electric generating unit in the municipal electric light and water plant is under consideration. O. A. Clarke is general superintendent.

ANDALE, KAN.—The Council will soon call for bids for the construction of a transmission line from Wichita to Ardale, to cost $37,000. The Ruckel Engineering Company, Interurban Building, Hutchinson, Kan., is engineer.

DODGE CITY, KAN.—The Electric Service Company contemplates the installation of a 1,250-kva. General Electric turbine and a 350-500-hp. boiler. M. D. Leslie is chief engineer.

SALINA, KAN.—The Salina Light, Power & Gas Company contemplates the installation of a 4,000-kw. turbo-generator, new switchboard and auxiliaries, feed-water evaporator and pumping equipment, to cost about $175,000, and also the erection of distribution lines to cost about $15,000. P. B. Harbaugh is superintendent.

SEDAN, KAN. — The Sedan Electric Light & Power Company contemplates the erection of 15 miles of 22,000-volt transmission line to connect with the system of the Kansas Gas & Electric Company. M. W. Hartzell is president.

Southern States

BADIN, N. C.—The Tallassee Power Company contemplates the erection of a hydro-electric plant of about 25,000 hp. capacity, to cost about $3,500,000, including machinery and transmission system. Electricity will be distributed by the Carolina Power & Light Company.

CLEMSON COLLEGE, S. C. — The trustees of Clemson College will install new equipment in the power plant at the institution.

ATLANTA, GA.—The Georgia Railway & Power Company has issued $3,500,000, in bonds, part of the proceeds to be used for extensions and improvements to its electric power plants and system.

MEIGS, GA.—Bonds to the amount of $15,000 have been voted for improvements in the municipal electric plant.

TIFTON, GA.—The Council contemplates the construction of a municipal electric power plant, to cost about $50,000.

CLERMONT, FLA.—The Council is considering the construction of a municipal electric plant.

FERNANDINA, FLA. — Bonds to the amount of $150,000 have been voted for extension to the municipal electric plant, ice factory and waterworks system, of which about $20,000 will be used for the electric plant.

UMATILLA, FLA.—The installation of new machinery at the municipal electric plant is under consideration.

NASHVILLE, TENN.—The Council has approved an ordinance for the rebuilding of the municipal electric plant, to cost $90,000.

PONTOTOC, MISS.—The Pontotoc Light & Water Company contemplates the erection of an 8-mile transmission line to furnish electrical service in Ecru. G. W. Campbell is superintendent.

MOUNTAIN HOME, ARK.—The Mountain Home Electric Power Company is making extensions and improvements to its plant. N. E. Taylor is superintendent.

MARLOW, OKLA.—Extensive improvements are contemplated to the municipal electric plant, including the installation of generators, oil engines, having a capacity of 300 hp., electric line extensions, etc. L. A. Pritchett is superintendent.

RUSH SPRINGS, OKLA.—The Council has plans under way for extensions and improvements to the local power plant, which has been taken over by the municipality. H. G. Olmsted & Company, Tradesmen's National Bank Building, Oklahoma City, are engineers.

STROUD, OKLA. — The Board of Trustees is considering installing a Diesel or semi-Diesel oil engine of about 125 hp. capacity in the municipal electric plant to replace the gas engine now in use. John A. Walker is manager.

WAPANUCKA, OKLA. — The Public Service Company will build a new transmission line from Atoka to Wapanucka, about 15 miles.

ALBANY, TEX.—The Abilene (Tex.) Gas & Electric Company has acquired the power plant of the Texas Stone Quarry Company and will soon extend its transmission line to Albany.

DALLAS, TEX.—The Texas Electric Railway has issued $625,000 in bonds, part of the proceeds to be used for extensions and improvements to power plants and system.

KERENS, TEX.—The Kerens Light & Power Company contemplates installing two 150-hp. engines to generate electricity to operate its system. The company now purchases energy from the Corsicana (Tex.) Gas & Electric Company. A. D. McKinney is manager.

NOCONA, TEX.—The Nocona Ice & Light Company expects to install a 100-hp. oil engine directly connected to a 2,300-volt alternating-current generator and to erect a high-tension transmission line from Nocona to Ringgold to connect with its plant there. J. W. Lehman is president and manager.

YORKTOWN, TEX. — The Yorktown Electric & Ice Company plans to rebuild the portion of its local plant recently destroyed by fire, causing a loss of about $50,000.

Pacific and Mountain States

ENTERPRISE, ORE. — The Enterprise Electric Company contemplates the construction of a new hydro-electric plant on the Wallowa River, with transmission line to include a number of towns in this section, to cost about $100,000.

PORTLAND, ORE.—The Portland Railway, Light & Power Company will make extensions and improvements in its system to cost $500,000. The work has been ordered by the Public Service Commission to be completed this year.

CHINO, CAL.—Steps have been taken by the Chamber of Commerce for the installation of an ornamental street-lighting system on Sixth and D Streets.

FULLERTON, CAL.—The City Trustees contemplate the installation of an ornamental lighting system on several streets in the city.

LOS ANGELES, CAL.—The Los Angeles Gas & Electric Corporation contemplates extensions to its system, including the installation of a 15,000-kw. turbo-generator, together with necessary condenser and cooling tower equipment, six additional Stirling boilers, 24,500 kva. capacity in transformers, two motor-generator sets of 750 kw. each, additional substation, high-tension lines and distributing equipment, etc. T. P. McCrea is secretary.

SANTA ANA, CAL.—The proposition to vote $75,000 in bonds for the installation of a municipal electric plant at the waterworks was defeated at a special election.

SAWTELLE, CAL.—The Council is considering the installation of an ornamental lighting system on the Santa Monica Boulevard to cost about $29,000.

STOCKTON, CAL.—A special election will be held on May 2, to vote on the proposal to issue $125,000 in bonds for the installation of a police and fire-alarm signal system.

YUBA CITY, CAL.—The Pacific Gas & Electric Company, San Francisco, is preparing plans for the erection of a new local substation to cost about $75,000. The company will also rebuild its transmission line across the Carquinez Straits, near Martinez to cost about $250,000.

ASHTON, IDAHO.—The Ashton & St. Anthony Power Company may possibly erect 10 miles of 6,600-volt transmission line to supply a 100-kw. mining load. R. F. Crouse, Idaho Falls, is manager.

McCALL, IDAHO.—The McCall Light & Power Company contemplates doubling the capacity of is plant. T. E. Bennett is owner and manager.

SALT LAKE CITY, UTAH.—The Denver & Rio Grande Railroad plans to consolidate two present power plants into a single unit in the viaduct section, to cost with new equipment about 40,000.

MALTA, MONT.—The Malta Light & Power Company expects to install a 150-hp. oil engine (Diesel or semi-Diesel type) directly connected to a three-phase, 60-cycle, 2,300-volt generator, switchboard and accessories. M. F. Kemper is manager.

GREEN RIVER, WYO. — The Green River Electric Light & Power Company contemplates enlarging its plant and increasing the output to 3,000 kw., to serve a coal mine 15 miles distant. J. H. Jacobucci is president and general manager.

ARRIBA, COL.—The Council has authorized $15,000 in bonds for the construction of a transmission line to Flagler. W. B. Rollins & Co., Railway Exchange Building, Kansas City, Mo., are engineers.

COLORADO SPRINGS, COL.—The Council contemplates the construction of a municipal electric plant at the Pike's Peak watershed, to cost, with transmission system, about $450,000. Surveys have been ordered. George G. Anderson is hydraulic engineer.

DENVER, COL.—A power plant will be built by the Chicago, Burlington & Quincy Railroad Company in connection with its proposed local shops, to cost about $2,000,000.

SIMLA, COL.—The Council has authorized plans for a municipal light and power plant, bonds for which have been voted.

LORDSBURG, N. M.—The Model Canal Company, Franklin, Ariz., is planning to construct a hydro-electric plant on the Gila River for irrigation service in this section.

Canada

KINGSTON, ONT.—Plans are under consideration to secure electricity from the Ontario Hydro-Electric Power Commission for Ernestown, Kingston and Pittsburg Townships.

MIMICO, ONT.—A by-law authorizing an appropriation of $25,000 for extension of the Ontario Hydro-Electric system in Mimico has been passed by the Town Council.

PORT CREDIT, ONT.—The Council has passed a by-law authorizing an issue of $20,000 in debentures for extensions to the hydro-electric power system within the town limits.

TORONTO, ONT.—Surveys are being made by the Ontario Hydro-Electric Power Commission for electric distribution systems in Kirkton, Winchelsea and Elimville, to cost about $45,000. A. Purcell, 190 University Avenue, is engineer.